United States Department of the Interior

FISH AND WILDLIFE SERVICE
ONE GATEWAY CENTER, SUITE 700
NEWTON CORNER, MASSACHUSETTS 02158

JUN 22 1989

Dear Reviewer:

Enclosed for your review is the Final Environmental Assessment to expand the boundary of Back Bay National Wildlife Refuge in the city of Virginia Beach, Virginia.

This Environmental Assessment addresses the threats to important fish and wildlife habitat within the study area. Various alternatives for long-term protection of these important habitats are presented, including land acquisition by the U.S. Fish and Wildlife Service.

The Service is providing this document for your review. Written comments would be appreciated within 30 days of the above date and should be addressed to:

Regional Director (RE)
U.S. Fish and Wildlife Service
One Gateway Center, Suite 700
Newton Corner, Massachusetts 02158

For further information, please contact Joann Raducha, Office of Realty, at (617) 965-5100, extension 410.

Sincerely yours,

Ronald E. Lambertson

Regional Director

Enclosure

FINAL
ENVIRONMENTAL ASSESSMENT

Proposal to Expand the Boundary

of

Back Bay National Wildlife Refuge

Virginia Beach

Virginia

June 1989

U. S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
REGION 5
NEWTON CORNER, MASSACHUSETTS

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BACK BAY NATIONAL WILDLIFE REFUGE EXPANSION PROPOSAL
PROJECT SUMMARY

Historically recognized for its large wintering waterfowl populations and its sport fishery, the Back Bay area is undergoing land use changes that will potentially impact important wildlife habitat. These expected changes in land use patterns over the next several years will limit both the quality and quantity of available wildlife habitat through the direct loss of habitat and resultant degradation of the Bay.

In this Environmental Assessment, the U.S. Fish and Wildlife Service (Service) describes a variety of alternatives that could provide long-term protection to important wildlife habitat located to the north and west of Back Bay National Wildlife Refuge in the city of Virginia Beach. Based on detailed study and considerable public comment, the Service will recommend approval of Alternative II, the Proposed Action. This alternative identifies approximately 6,340 acres of important wildlife habitat consisting of brackish marsh, forested swamp, and low-lying agricultural fields and woodlands within the original study area.

The study area was broadly defined at the onset of the project in order to adequately address the physical, biological, and socioeconomic effects of various land protection alternatives on the community as a whole. The draft Environmental Assessment identified 6,400 acres of important wildlife habitat within this broadly defined area for proposed Service acquisition. This line has been further modified in the attached document. The remainder of the study area is not being considered for Service acquisition.

The preparation of this Environmental Assessment is the result of an extensive planning process which began in August, 1988, with Congressional and city briefings and the December release of a draft Environmental Assessment for a 45-day public review period. This period was subsequently extended to June 15, 1989. The issues and concerns identified during the draft Environmental Assessment review process have been addressed in detail in the attached document.

The review period produced a significant number of responses. A public meeting held on January 10 was attended by approximately 275 people. The Service received petitions totaling over 1,000 signatures in support of Alternative II, as well as over 350 letters from individuals, families, organizations, and various agencies. Approximately 77% of these letters were written in support of Alternative II. Of the remainder, approximately 25% stated they preferred Alternative III, the minimum acquisition approach.

Many respondents stressed the need to provide long-term protection to habitat identified within the Proposed Action by establishing a land acquisition boundary. The value of these lands to a diversity of wildlife species and their function in water quality protection were cited. The Policy Committee for the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan fully endorses the project based on its contribution to wintering black ducks. The Commonwealth of Virginia is also supportive.

Although the Service's long-standing acquisition policy of acquiring lands from willing sellers at fair market value was discussed on several occasions throughout the planning process, numerous comments reflected concerns for the methods by which the Service would acquire property. Landowners and municipal officials should recognize that it is the intent of the Service to continue with this acquisition policy. In addition, landowners and officials were assured that the proposed boundary would not place any additional regulatory controls on affected landowners.

There was also much discussion concerning the actions needed to restore Back Bay as a productive resource. The actions outlined in the Proposed Action alternative are not intended as a panacea to the problems facing the Bay. Land acquisition is only one of the steps that will be required if the Bay is to return to its former state as a highly productive surface water resource. It will take a concerted effort by several levels of government and the private sector if the Bay is to recover. By purchasing and managing the lands outlined in the Proposed Action, the Service will become an active participant in the effort to preserve the resources of Back Bay.

The Service received a number of comments concerning the location of existing homes and future road and utility expansion on Sandbridge Road. The recommended boundary (see map on page 11) has been modified to exclude several residences and sufficient acreage for future road and utility expansion on Sandbridge Road. Other concerns included the effect of the proposal on the following: land value, tax revenues, Bay and property access, recreational opportunities, family cemeteries, and property rights, as well as existing and potential Refuge management practices, acquisition funding source, and protection through existing legislation.

These and other concerns have been addressed in detail in the attached document. Members of the public, local, state, and federal agencies along with resource organizations are encouraged to review the accompanying Environmental Assessment.

I. INTRODUCTION

A. Purpose and Need

This Environmental Assessment (EA) addresses the threats to important fish and wildlife habitat within the southeastern portion of the city of Virginia Beach, Virginia. The general study area considered in this Assessment is shown in Figure 1. A map of the Back Bay National Wildlife Refuge (Refuge) is shown in Figure 2. In addition to discussing the area's valuable wildlife resources, the Assessment outlines various alternatives, including land acquisition by the U.S. Fish and Wildlife Service (Service), that could provide long-term protection for these wildlife habitats.

The proposed boundary expansion line has been delineated within the study area to incorporate approximately 6,340 acres of important wildlife habitat consisting of brackish marsh, forested swamp, and primarily undeveloped upland edge habitats. Upland habitats consist of low-lying agricultural fields and woodlands. The original study area was broadly defined in order to adequately address the physical, biological, and socioeconomic effects of the proposed boundary expansion on the community as a whole. To study only those lands that may be identified for acquisition and ignore those lands adjacent would not adequately address the project's impact. Remaining lands within the study area are not considered for Service acquisition.

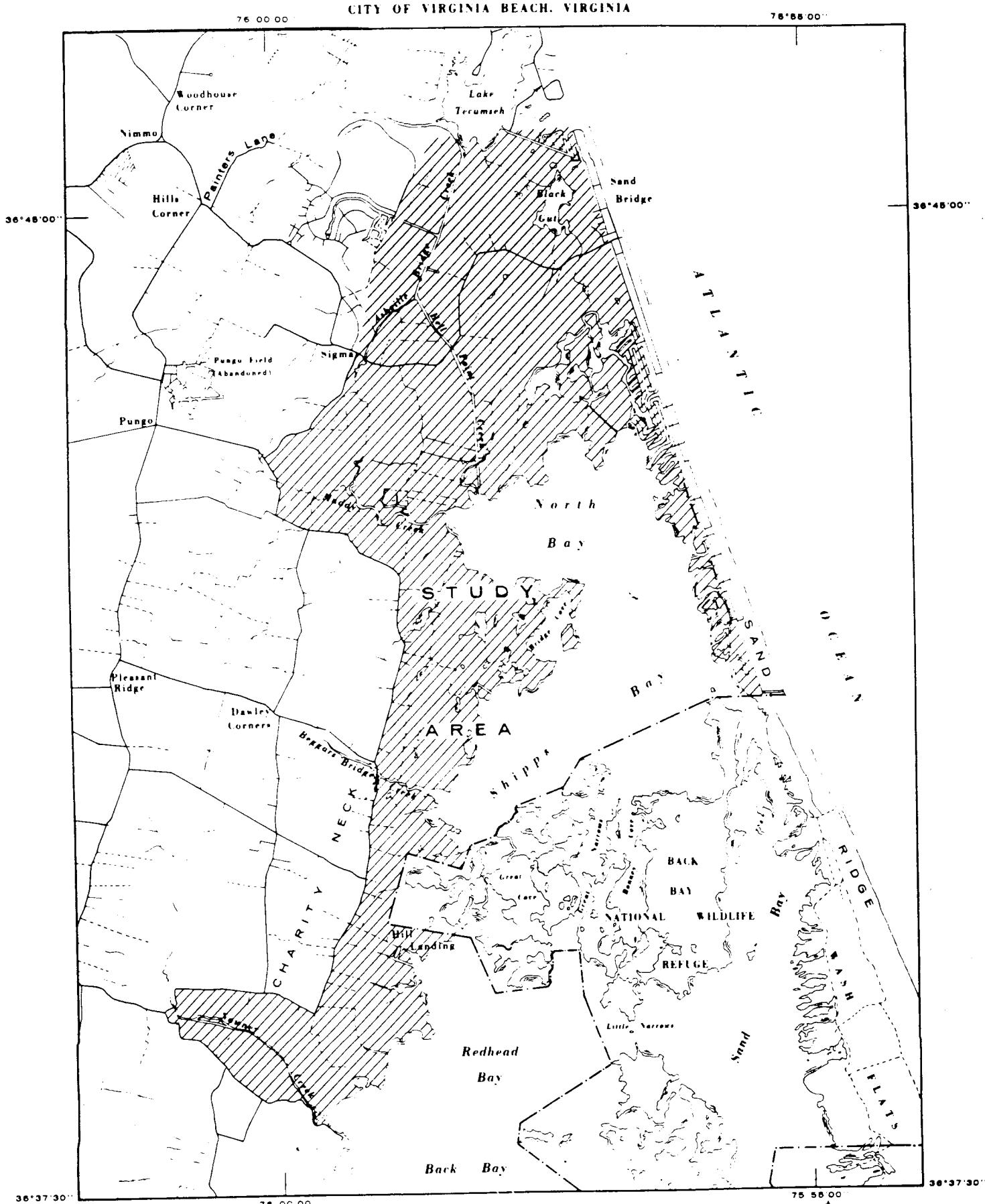
This effort has been undertaken because of ongoing and potential land use changes which will impact wildlife habitat used by a diversity of migratory birds including waterfowl, raptors, shorebirds, passerines, and marsh and waterbirds. This effort alone will not restore water quality of Back Bay (Bay), nor does the Service claim that acquisition will accomplish this. However, development of upland fringe habitats adjacent to wetlands within the proposed acquisition area are expected to further contribute to the ongoing decline in the quality of submerged aquatic vegetation (SAV) habitat in Back Bay through increased pollutant and sediment laden runoff. These upland fringe habitats serve in an important filtering capacity. Without positive action to limit habitat destruction adjacent to the Bay through this and other efforts, future recovery of the Bay itself is questionable.

The issue of water quality of the Bay is a complex one. The federal government alone can not shoulder the burden of protecting our valuable natural resources. The state of Virginia, city of Virginia Beach, private organizations, and individual citizens must also accept the responsibility of preserving a healthy environment through a cooperative effort to minimize the impact of urban and agricultural development on Back Bay.

Service acquisition will complement such efforts through the protection of important wildlife habitat adjacent to the Bay. The Service is the principal agency through which the U.S. Government carries out its responsibilities to conserve, protect, and enhance the nation's fish and wildlife and their habitats for the continuing benefit of people. Land acquisition is one of the primary means with which the Service fulfills these responsibilities.

STUDY AREA FOR THE BACK BAY NATIONAL WILDLIFE REFUGE BOUNDARY EXPANSION

CITY OF VIRGINIA BEACH, VIRGINIA



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FROM SURVEYS BY U S G S AND U S F & W S

August 1988
NEWTON CORNER, MASSACHUSETTS

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8° North MEAN DECLINATION 1980

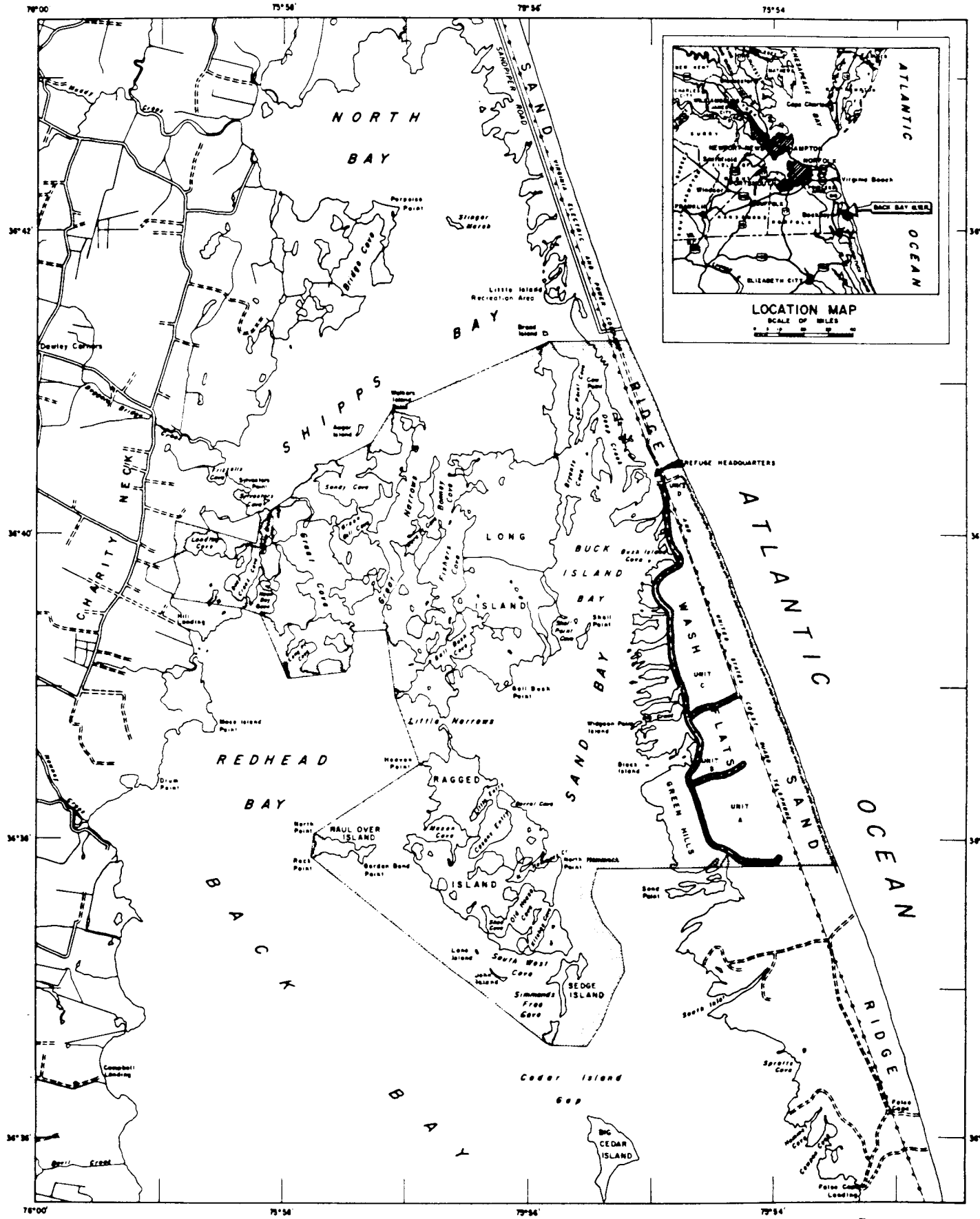
FIGURE 1

BACK BAY NATIONAL WILDLIFE REFUGE

CITY OF VIRGINIA BEACH, VIRGINIA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



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FROM SURVEYS BY U.S.G.S.

NEWTON CORNER, MASS FEBRUARY 1973

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MEAN DECLINATION 1964

FIGURE 2 5R VA 248

B. Study Area Location

The original study area encompassed approximately 8,400 acres of land to the north and west of the existing Back Bay National Wildlife Refuge. The approximate boundaries of the study area are Sandpiper Road on the east, Lake Tecumseh on the north, Muddy Creek and New Bridge Roads on the west, and Nanney's Creek on the south. The study area includes portions of the drainages of Ashville Bridge Creek, Hell Point Creek, Muddy Creek, Beggars Bridge Creek, and Nanney's Creek. Wildlife habitat within this area consists of approximately 6,340 acres of fresh-brackish marsh, forested swamp, low-lying agricultural fields and woodlands, and streams. The proposed boundary expansion line is delineated within this study area to incorporate this important wildlife habitat. Remaining lands within the study area are not considered for Service acquisition.

C. Background

The southern portion of Virginia Beach has, until recently, remained a relatively rural, agricultural area. Development has occurred along the barrier spit in Sandbridge and along the western part of the Bay on Colechester, New Bridge, Muddy Creek, Nanney's Creek, and Mill Landing Roads.

Much of the area is zoned agricultural with development allowed at the rate of one house per acre. In 1985, elected officials of the rapidly growing city recognized that the pace of development in Virginia Beach was rapidly exceeding the city's ability to provide needed services to the increasing populace. As a result, the City Council passed an ordinance establishing a "Green Line", south of which development would be curtailed for several years. The establishment of the Green Line resulted in the "downzoning" of several areas which had previously been zoned for high-density development. Parts of the downzoned areas occur within the study area. The issue of downzoning on specific parcels has been successfully challenged in the local district court.

The Green Line concept was not intended to prohibit development in the southern portions of the city in perpetuity. In fact, development continues to occur under existing farmland and business zoning designations--especially adjacent to roadways in the study area. The Green Line was envisioned as a stop-gap measure to allow the city to "catch-up" on needed schools, roads, and other services. As remaining developable land is exhausted in the northernmost portions of the city, development pressure will be focused on the study area.

The decline of waterfowl habitat in Back Bay itself is well known. The Bay has experienced wide fluctuations in the quantity and quality of habitat, especially submerged aquatic vegetation (SAV). The most recent decline began in the late 1970's as Eurasian milfoil beds (established in the late 1960's - early 1970's) and associated native vegetation (which had become re-established within these beds) began to decline. The exact cause of the decimation of submerged aquatics in Back Bay is unknown. However, it is undoubtedly related to siltation and turbidity. Area

streams and drainage ditches discharge water containing large quantities of silt directly into Back Bay. These suspended solids limit sunlight penetration and apparently prevent the re-establishment and growth of SAV's.

Waterfowl populations in the Bay have declined with the loss of the viability of the Bay itself. Existing waterfowl use is concentrated primarily on certain managed wetlands located on state and federally protected lands. Virginia provides habitat for nearly 15% of the Atlantic Flyway wintering black duck population. The marshes in the Back Bay area have been identified as important black duck wintering habitat in the Service's Category Plan for the Preservation of Black Duck Wintering Habitat on the Atlantic Coast (1988). The Category Plan is a high priority of the North American Waterfowl Management Plan because of the decline in the black duck population over the past 30 years.

The North American Plan is a "strategy for cooperation". Signed on May 14, 1986, this International Plan is a blueprint for recovery of declining waterfowl populations. It is designed to reverse the continent-wide destruction of wetland habitats and offers a clearly defined set of goals and objectives to increase and restore duck populations from their current all-time low levels. The Plan recommends a cooperative effort among federal, state, local governments, private organizations and citizens in planning, funding, and implementing projects to preserve or enhance waterfowl habitat that will contribute, by the year 2000, to a continental breeding duck population level of 62 million waterfowl and a fall flight of over 100 million birds during average years. Loss of habitat has been cited by the Plan as the most serious threat facing North America's waterfowl. Under this Plan, Canada has agreed to protect breeding grounds for the black duck, while the United States will fulfill its obligations for black duck recovery through the protection of black duck migration and wintering habitat along the Atlantic Coast.

Local wetlands and other wildlife habitat are important to the management of waterfowl and wetland-dependent migratory bird species. Wading bird populations in the Tidewater Virginia area are rapidly losing nesting and feeding habitat due to destruction of woodlands and wetlands in Virginia Beach and Chesapeake. Wintering Canada geese populations are near historic lows due to short-stopping and changes in farming practices in Maryland, Pennsylvania, and New York. An important Service objective is to increase the numbers of Canada geese wintering south of the Maryland-Virginia state line. Federally endangered and threatened species that may occur in the study area include bald eagles and peregrine falcons. Important plant species include live oak and bald cypress, which occur near the northern limits of their respective ranges.

II. ALTERNATIVES

Introduction - The success of long-term protection for important wildlife habitat within the study area will depend on: (1) the strength of local, state, and federal laws and regulations; (2) the economy of the area as it relates to residential and commercial development; and (3) the conservation ethic of the landowner which is reflected in the uses of his/her property. The following alternatives reflect protection approaches based on: (1) existing regulations, (2) varying degrees of federal protection (Service acquisition), and (3) protection efforts of state or local agencies or organizations.

A. Alternative 1 - "No Action"

Under this alternative the Service would rely on existing state, federal, and local laws and regulations to protect the wildlife habitat within the study area. It is essentially a prediction of future conditions within the study area without active protection efforts and acts as a benchmark against which impacts of the other alternatives can be measured.

If lands within the study area are not acquired or otherwise protected, a major portion of important wildlife habitat could be altered or destroyed by a variety of land use changes. Under this alternative, the Service would continue to review projects pursuant to its responsibilities under various federal statutes. Following is a summary of federal, state, and local laws and regulations:

Federal Laws and Regulations

The Fish and Wildlife Service reviews proposals for activities in or affecting navigable waters that are sanctioned, permitted, assisted or conducted by the federal government. These review functions, delegated to the Service by the Secretary of the Interior, are prescribed by the Fish and Wildlife Coordination Act, the National Environmental Policy Act of 1969, the Estuary Protection Act, the Airport and Airway Development Act of 1970, the Watershed Protection and Flood Protection Act, the Endangered Species Act, and various Executive Orders. The following are the most important laws to which the Service review function applies.

1. Rivers and Harbors Act of 1899

Section 10 of this Act declares it unlawful to build in navigable waters of the United States, or to excavate, or fill, or in any manner to alter or modify the course, location, conditions or capacity of any navigable water of the United States, unless the activity is approved by the Chief of the Corps of Engineers (COE) and the Secretary of the Army. Certain COE permits also require approval by the Environmental Protection Agency (EPA) as a result of the Federal Water Pollution Control Act of 1972, as amended.

Navigable waters are defined in common and case law as any water that is or has been navigable in fact, or is capable of being made navigable through reasonable improvements, including any shoals, falls, rapids, or other interruptions requiring land portage and that is used or useful in interstate or foreign commerce. The federal jurisdiction on such waters extends throughout their length (including non-navigable tributaries in some decisions) and laterally to the limit of the plane of the ordinary high water, defined on rivers as neither the flood nor lowest flow stage, but the usual high water state, and on tidal waters as the mean high tide line.

2. Federal Water Pollution Control Act of 1972 (FWPCA) as amended by the Clean Water Act of 1977 (CWA)

This Act set up a federal permit system to regulate the discharge of pollutants into waters of the United States. The Act is administered by EPA and proclaimed two goals for the United States: (1) to achieve swimmable, fishable waters wherever attainable by 1983, and (2) to eliminate the discharge of pollutants into navigable waters.

Section 208 of the Act (Water Quality Management) ties together various water pollution control and abatement requirements, including municipal, industrial, and residual waste, runoff, and ground water pollution control. The Act places the responsibility for development and carrying out solutions to these problems with state and local governments. Under Section 208, geographic areas with significant water quality problems are singled out for area-wide planning. EPA provides funding to develop the plan to control all point and non-point source pollution and land use as it relates to water quality. Although wetland protection can be incorporated into Section 208 management plans, the resulting planning relates primarily to water pollution and water quality. Nothing in the Act would prevent landowners from draining wetlands and growing crops, unless the agricultural practices would result in a water pollution problem.

Section 402 of the Act requires permits from EPA for the discharge of any pollutant, except dredge or fill material, into navigable waters. Under this program it is illegal to discharge any unpermitted refuse into any navigable waters of the United States. This program has been assumed by the Commonwealth of Virginia.

Section 404 - The 404 regulatory program, which regulates the discharge of dredged or fill material into waters of the U.S., was enacted as part of the 1972 FWPCA and amended during the 1977 CWA reauthorization. The permit program is administered by the Corps of Engineers and EPA. Most types of development or construction in the nation's waters and wetlands involve some discharge of material and,

thus require a 404 permit. The program is the main federal vehicle for protecting wetland areas since conversion of wetlands often involves placement of dredge or fill material.

The COE is the primary agency that administers the program. This agency issues or denies permits, writes program regulations, and conducts most of the enforcement work. The COE also develops general permits for categories of similar activities with minimal environmental impact. The 404 program is related to the COE's other regulatory authorities under the Rivers and Harbors Act and the Marine Protection, Research, and Sanctuaries Act.

The Environmental Protection Agency writes the environmental guidelines under 404 (b)(1) which are the substantative regulations used to evaluate permit applications. EPA has authority under section 404(c) to "veto" COE-issued permits or predesignate an area as unsuitable for disposal, based on a determination of unacceptable impact. EPA is responsible for delegating the program to qualified states in accordance with agency regulations. EPA also has parallel enforcement authority under Section 309 of Act.

COE regulations state that "full consideration" must be given to fish and wildlife concerns. In practice, however, the Corps considers fish and wildlife impacts as part of their overall public interest review along with a number of other factors.

3. Executive Orders

Executive Orders are issued, periodically, to formulate executive policy and promulgate executive directives to federal agencies on current issues. Such policy directives provide an important source of guidance for federal agency actions. Two pertinent orders were issued on May 24, 1977, by President Carter:

Executive Order 11990, entitled "Protection of Wetlands", reads in part: "Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the Agency's responsibilities . . . ," and " . . . each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds that: (1) there is no practicable alternative to such construction, and (2) the proposed action includes all practicable measures to minimize harm to wetlands which may result from each use".

Executive Order 11988, entitled "Flood Plain Management" states in part: "Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities for (1) acquiring, managing, and disposing of

federal lands and facilities; . . . and . . . (2) conducting federal activities and programs affecting land use, including but not limited to water and related land resource planning..."

While the intent of the orders is well meaning, inland and coastal wetlands will not be preserved or protected from other than federal activities. Furthermore, implementation of Executive Orders lies with each federal agency. There is no mechanism to review or reconsider a federal agency's decision that its project complies with the Executive Orders.

State Laws and Regulations

1. Virginia Wetlands Act of 1972 (Section 62.1)

This Act, which regulates tidal wetlands, is administered by the Marine Resources Commission. Local governments are authorized to set up local boards to exercise jurisdiction and issue permits for wetlands development and to adopt a wetlands zoning ordinance. The city of Virginia Beach has established a wetland board under this Act.

The declaration of the policy of the Act states "to preserve the wetlands and to prevent their despoliation and destruction and to accommodate necessary economic development in a manner consistent with wetlands preservation" (62.1-13.1). Section 62.1-13.3.2 states, however, "Development in Tidewater Virginia, to the maximum extent practical, shall be concentrated in wetlands of lesser ecological significance, in vegetative wetlands which have been irreversibly disturbed before July 1, 1972, in non-vegetated wetlands as described herein which have been irreversibly disturbed prior to January 1, 1983, and in areas of Tidewater Virginia apart from wetlands." The law applies to tidal wetlands only.

2. Chesapeake Bay Preservation Act

The primary purpose of this Act is to protect water quality of the Chesapeake Bay and its tributaries from non-point source pollution resulting from land use and development. Regulations, which will not be effective until later this year, propose the establishment of Resource Protection Areas and Resource Management Areas where development will be regulated. Local governments will have the initiative for implementation and enforcement of the criteria. However, compliance by municipalities outside of the Act, including the city of Virginia Beach, will be optional. It is too early to determine what effect this Act will have on preservation efforts.

City Laws, Regulations, and Programs

1. Zoning

Zoning is the principal mechanism that local governments employ to regulate the use of lands; however, zoning is not static and is subject to periodic review and change, as well as court challenges. The majority of land within the study area occurs south of the Green Line which separates the more urban northern portions of Virginia Beach form the predominantly rural southern areas below Sandbridge Road. Thus, the study area is zoned primarily for agriculture with the exception of the Sandbridge community which is zoned for fairly dense, residential development. North of Sandbridge Road, a strip adjacent to the road and approximately 800-1,000 feet in width is zoned for business. The study area portion north of the Green Line is primarily zoned for single family residential development. The Green Line is not a permanent feature, but is subject to change as conditions and community standards related to adequacy of facilities north of the Green Line change.

2. Transfer of Development Rights Program (TDR)

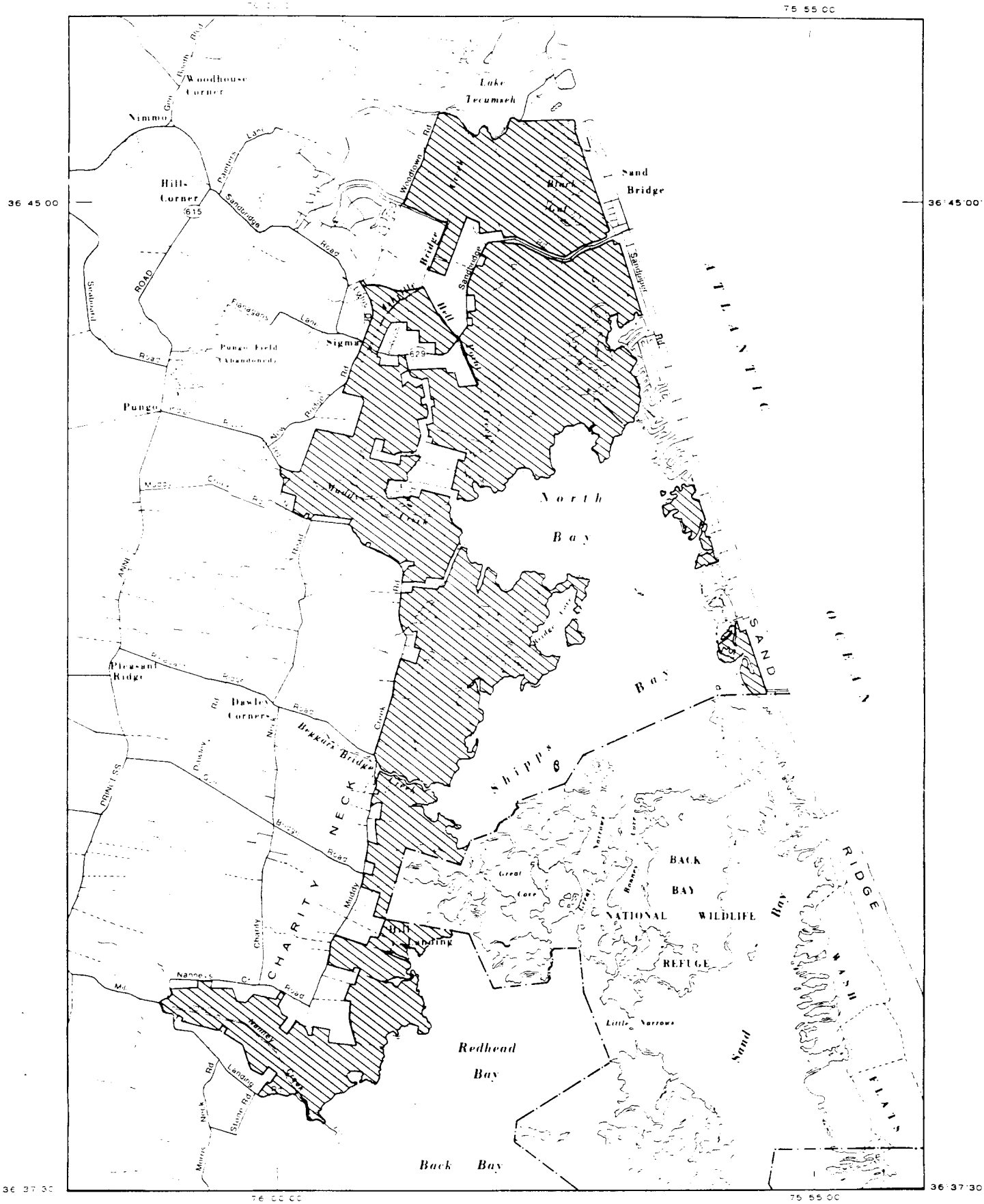
This program has been under study by the city of Virginia Beach. If implemented, the program would allow farmers in the rural southern portion of the city to sell development rights on their land to developers in the northern portion. Implementation of this program is dependent on the city obtaining a specific charter amendment from the Commonwealth of Virginia's General Assembly, in order that Virginia Beach be invested with proper authority to enact a TDR system. Currently, no other municipality in the Commonwealth has utilized this technique for land protection purposes. The House Committee recently voted down the bill to establish a TDR system; however, a study committee has been appointed to work on the idea for one more year.

B. Alternative 2 - "Proposed Action"

Under this alternative, the Service proposes to provide long-term protection to approximately 6,340 acres of important wildlife habitat by establishing a land acquisition boundary within the study area (Figure 3). Within this boundary, lands (or interest therein) would be acquired for inclusion into the National Wildlife Refuge System. The acquired lands would be managed as part of the Back Bay National Wildlife Refuge. The objectives for management of the refuge were outlined in the 1970 Master Plan. The following management objectives are essentially unchanged from those that occurred in the Master Plan. They have been updated through the years to read as follows:

1. To develop and manage the refuge for a full spectrum of wildlife, insuring that populations are in balance with the carrying capacity of the habitat. Special emphasis is placed on greater snow

ALTERNATIVE 2 - PROPOSED U.S. FISH & WILDLIFE SERVICE ACTION
FOR THE BACK BAY N.W.R. BOUNDARY EXPANSION
CITY OF VIRGINIA BEACH, VIRGINIA



COMPILED IN THE DIVISION OF MAPPING
FROM SURVEYS BY U.S.G.S. AND U.S.F.&W.S.

August 1988
NEWTON CORNER, MASSACHUSETTS

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8° MEAN DECLINATION 1980

FIGURE 3

geese, other waterfowl, and shorebirds. This objective includes cooperation with other agencies in improving and maintaining optimum waterfowl habitat in Back Bay.

2. To enhance conditions for all species of wildlife on the refuge whose survival is in jeopardy. These include federally listed endangered and threatened species such as the peregrine falcon, bald eagle, piping plover, and loggerhead sea turtle.

3. To provide wildlife-oriented recreational opportunities for refuge visitors.

4. To provide an outdoor classroom for universities, colleges, and public schools for environmental education with special emphasis on wildlife and habitat management.

5. To preserve portions of the refuge in a natural state, including a stand of live oak near the northern limits of the range of this species.

This alternative would include those lands within the study area that support or have the potential to support a diversity of migratory birds including waterfowl, raptors, songbirds, shorebirds, and marsh and waterbirds. These species along with their supporting habitats are discussed later in this report.

The acreage identified in this alternative (6,340 acres) consists of approximately 48% brackish marsh, 27% forested swamp, and 25% critical edge habitats consisting of poorly drained, low-lying agricultural fields and woodlands. All lands identified for acquisition are within the 100-year flood plain and primarily below 5 feet mean sea level (msl). Acquisition does not include the Bay itself, as this ownership is reserved by the state of Virginia.

As the proposed land acquisition boundary was developed, special consideration was given to developed areas. Residential and commercial development was excluded from the periphery of the boundary. Boundary delineation did include several improvements, primarily seasonal hunt clubs, that were located deep within the proposed acquisition boundary within low-lying areas adjacent to the marsh edge. Landowners, as well as municipal officials, should be fully aware that the Service's long-standing acquisition policy is to work with willing sellers, as funds become available. In other words, landowners within the boundary are under no obligation to sell their property to the Service.

The acquisition policy of the U.S. Fish and Wildlife Service should not be confused with the acquisition policy of other federal agencies. The Service, like all other federal agencies, has been given the power of eminent domain which allows the use of condemnation to acquire lands and interests in lands for the public good. However, because the Service recognizes the possible social and economic impacts of acquiring private property by exercising the right of eminent domain, it does its utmost to

avoid using this approach. In recent years, this has become increasingly true as greater emphasis has been placed on the willing seller policy. For example, since 1978 less than one-half of 1% of all Service acquisitions nationwide were acquired by eminent domain. These condemnation cases primarily involved the determination of legal ownership (clear title) or settling a difference of opinion concerning value. Others involved preventing uses which would cause irreparable damage to the resources for which the refuge was established.

Service acquisition projects are funded through the Land and Water Conservation Fund and/or the Migratory Bird Conservation Fund. The Migratory Bird Conservation Fund is funded by the sale of duck stamps. Receipts from the sale of the stamps are set aside in a special Treasury Account, known as the Migratory Bird Conservation Fund, and are appropriated to the Secretary of the Interior for the acquisition of migratory bird refuges under the provisions of the Migratory Bird Conservation Act. Since 1961, Congress has provided additional funding to this account. In 1986, Congress again authorized additional revenue for the Migratory Bird Conservation Fund through 70% of entrance fees collected at various refuges and sales of Golden Eagle Age passports, along with import duties collected on arms and ammunition.

The Land and Water Conservation Fund is funded by certain user fees, proceeds from the disposal of surplus federal property, and the federal motorboat fuels tax. Amendments in 1968 and 1970 authorized funds to be supplemented by unappropriated Treasury funds and from oil and gas lease revenues on the Outer Continental Shelf. Approximately 90% of Land and Water Conservation Funds now come from Outer Continental Shelf oil and gas lease revenues. The federal government receives 40% of this fund for the "acquisition and development of certain lands".

If this proposal is approved and an acquisition boundary is established, it would not place any additional regulatory controls on affected landowners, other than existing local, state, and federal regulations. A land acquisition boundary enables the Service to obtain approval to acquire lands within, rather than on, a lengthy case-by-case basis. It also serves as an internal mechanism to direct future Service acquisition efforts and plan the budget accordingly.

The Service has no intention, nor would it have a legal standing, to acquire publicly owned roads or to restrict access to established communities or individual properties. It is not unusual for a refuge to be bisected by a publicly owned road. This is a fairly typical situation on many refuges throughout the nation.

If the Service were to acquire property and it became necessary to expand a road corridor or to allow for additional or expanded utility right-of-way (i.e., water, sewer, electrical, telephone), the Service would consider a right-of-way application from the appropriate municipal or utility authority. This process is well established and requests are routinely considered throughout the National Wildlife Refuge System. Applications are to be filed with the Regional Director and should

include an appropriate environmental analysis. Requests would be evaluated on a case-by-case basis considering impacts on the refuge and associated wildlife resources. The Service would coordinate closely with the city or utility authority in accordance with existing laws and right-of-way procedures. It is not the mission of the Refuge System to provide or deny city services to established communities. This is a local and state government function. To illustrate this, the Service has already excluded the 10-acre portion necessary to widen and straighten the last mile of Sandbridge Road.

Potential acquisition methods within this proposed boundary include donations, conservation easements, and fee title purchases as funding becomes available. In acquiring lands for habitat protection, the Service's land acquisition policy is to obtain the minimum interest necessary to satisfy refuge objectives. Conservation easements can sometimes be used in this context when they can be shown to be a cost-effective method of protection. In general, any conservation easement must preclude destruction or degradation of habitat and allow refuge staff to adequately manage uses of the area for the benefit of wildlife. Because development rights must be included, the cost of purchasing conservation easements often approaches that of fee title purchase. This sometimes renders this method of acquisition unfeasible. However, donations of easements or voluntary deed restrictions prohibiting habitat destruction will be encouraged.

Finally, the Service could negotiate management agreements with local and state agencies or accept conservation easements on upland tracts. For example, a portion of the Little Island City Park Recreation Area, owned by the city of Virginia Beach, has been included within the proposed boundary. This portion, which provides important habitat, has no development potential. The Service would approach the city in an attempt to develop a partnership for management of this land. This would include entering into a Cooperative Agreement, Memorandum of Understanding, or Easement Agreement with the city to enhance wildlife values on those lands that are not currently used for recreational purposes.

C. Alternative 3 - Minimum Acquisition Approach

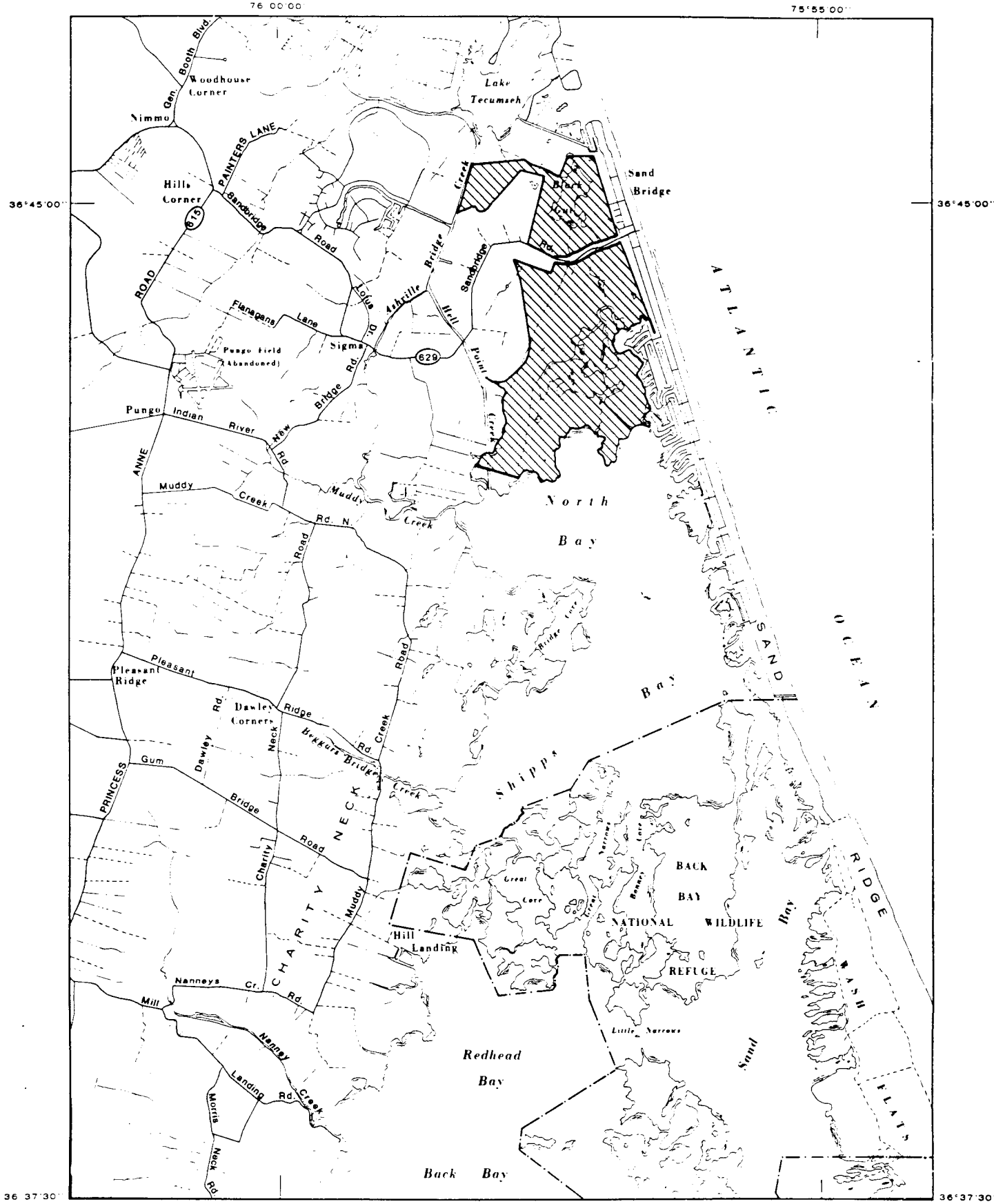
Under this alternative, the Service would identify a single ownership within the "Proposed Action" alternative for acquisition (Figure 4).

The landowner had previously asked the Service to consider the property for inclusion in the National Wildlife System. The parcel is located to the north of North Bay and is bisected by Sandbridge Road. The approximately 1,700-acre parcel consists primarily of brackish marsh, open water, and forested swamp habitat.

ALTERNATIVE 3 - MINIMUM ACQUSITION APPROACH FOR THE BACK BAY N.W.R. BOUNDARY EXPANSION
CITY OF VIRGINIA BEACH, VIRGINIA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U S G S AND U S F & W S

August 1988
NEWTON CORNER MASSACHUSETTS

SCALE 0 3000 6000 9000 12000 FEET
0 .75 1.50 2.25 3.0 KILOMETERS

8° North MEAN DECLINATION 1980

FIGURE 4

D. Alternative 4 - Protection by Other Agencies

This alternative considers the possibility of other conservation-oriented agencies or organizations providing long-term protection to those habitats susceptible to land use change. This effort could be accomplished individually or as a combined effort by a variety of agencies or groups. Other federal agencies, state and local governments, along with private conservation groups, would be primarily involved.

An alternative to qualified farmers who do not wish to sell fee title or development rights to their land, but are interested in preservation, is the Conservation Reserve Program (CRP), a conservation provision of the Food Security Act (Farm Bill) of 1985. The program is administered by the U.S. Department of Agriculture (USDA) through county offices of the Agricultural Stabilization and Conservation Service. This program provides an opportunity for qualified farmers to enter into a ten-year contract with USDA. Under this contract, the farmer may take certain highly erodible lands, farmed wetlands, and filter strips along wetlands or waterways, out of annual crop production and receive annual rental payments for applying soil conservation procedures and prescriptions, such as the re-establishment of natural vegetation for wildlife and water quality improvement. The farmer also receives federal cost-sharing benefits to help defray the expense of establishing permanent vegetative cover on their land.

The State Department of Game and Inland Fisheries manages certain lands for a broad spectrum of wildlife benefits. They currently protect approximately 1,158 acres in the Trojan and Pocahontas Waterfowl Management Areas located south of the study area. The Division of State Parks administers False Cape State Park, at the southern end of the refuge, which consists of 4,321 acres. Little Island City Park Recreation Area, owned by the city of Virginia Beach, consists of 144 acres located north of the refuge boundary.

In addition, the Virginia Natural Heritage Program was established in 1986 as a cooperative effort of the Virginia Department of Conservation and Historic Resources and The Nature Conservancy, a private, non-profit organization dedicated to the preservation of natural diversity. In 1988, the Virginia Natural Heritage Program became an organizational component of the Department of Conservation and Historic Resources in the newly created Division of Natural Areas Conservation. With the creation of this new Division, the Department is a major entity providing biological inventory and evaluation, acquisition, and management of natural areas. The Virginia Natural Heritage Program represents the first comprehensive attempt to identify the Commonwealth's most significant natural areas through an intensive statewide inventory.

To assure the protection of critical environmental areas, the Commonwealth, in cooperation with The Nature Conservancy, created the Natural Area Preservation Fund for the purpose of land acquisition. The Division seeks to protect and manage natural areas identified by the Virginia Natural Heritage Program on public and private land, utilizing a

variety of conservation tools to accomplish this goal. Ongoing evaluations by the Natural Heritage Program have ranked the Back Bay area high in its need of protection; however, a comprehensive inventory to identify specific sites is only in the preliminary stages.

Conservation-oriented organizations that actively seek to protect areas of high resource value include The Nature Conservancy, Trust for Public Lands, Ducks Unlimited, and the Audubon Society. The goal of these organizations is generally to conserve, protect, and manage areas for scientific, educational, or recreational purposes.

III. AFFECTED ENVIRONMENT

A. Physical Resources

1. Climate

The climate of Virginia Beach is modified continental with mild winters and hot, humid summers. The average temperature in winter is 42° F and the average daily minimum temperature is 33° F. In summer, the average temperature is 77° F, and the average daily maximum temperature is 85° F. Annual precipitation averages 45 inches. Of this total, 25 inches, or 56 percent, usually falls in April through September. The growing season is 237 frost-free days, the longest growing season in Virginia. The average seasonal snowfall is 7.2 inches. The average relative humidity in mid-afternoon is approximately 58 percent. Humidity is higher at night, and the average at dawn is about 78 percent.

The prevailing wind is from the southwest. Average windspeed is highest in March at 10.6 miles per hour. The area is frequently subject to storms out of the northeast during fall, winter, and spring. These storms can produce localized flooding and severe shoreline erosion. The summer in Virginia Beach produces numerous thunderstorms whose strong winds and heavy rains sometimes result in localized flooding. Although Virginia Beach is north of the track usually followed by hurricanes and tropical storms, the city has been struck infrequently by hurricanes.

2. Air and Noise Quality

The air quality for the city of Virginia Beach is rated high. Due to the location of Oceana Naval Air Station, noise levels can be excessively high in certain sections of the city.

3. Geology

Following is a geologic description of the city of Virginia Beach and Back Bay area as described by Mann (1984):

Virginia Beach lies within the Atlantic Coastal Plain Physiographic Province. The physiography of the area is typical of that of most of the Atlantic seaboard and consists of gently sloping terrace plains extending seaward from the base of the Appalachian Mountains.

The westward limit of the Atlantic Coastal Plain is defined by a break in slope, or "fall line," at the foot of the Appalachians. Both at and west of the fall line, eastward-facing slopes may approach 400 feet per mile, while to the east across the coastal plain, slopes do not exceed 2 feet per mile. In Virginia, this break in slope is approximated by a north/south trending zone through the towns of Emporia, Stony Creek, Petersburg, and Richmond.

The bedrock exposed along the steeply sloping portions of the fall line is a granitic rock of Precambrian Age (600 million years old). East of the fall line, the granite plunges beneath considerably more recent deposits of unconsolidated and semi-consolidated sediments which compose the coastal plain. The angle at which the granite dips below these sediments is such that in the Back Bay region, the granite bedrock, or "basement rock" lies at depths approaching 4,000 feet.

Six stratigraphic units compose the 4,000 feet of unconsolidated sediments of the Coastal Plain in the Virginia Beach and Back Bay region. These materials are considerably younger than the granite basement rocks. The oldest units, the Patuxent, is of Lower Cretaceous age [146 million years before present (mybp)]. The entire wedge of coastal plain sediments is composed of stream-carried sands and clays deposited along a shoreline and nearshore environment not dissimilar to that which presently exists in the area. These include beach and dune environments, salt marshes, stream channels, and flood deposits. The source of the sands and clays was primarily the down wasting of the eastern seaboard continental land mass.

The Patuxent Formation consists of interbedded gravel, sand, silt, and clay lenses and represents the thickest unit within the Coastal Plain in this region. Beneath the Virginia Beach shoreline, the Patuxent extends from an uncomformable contact with the basement granite to a height of approximately 1,100 feet below mean sea level.

The Patuxent Formation is overlain by approximately 100 feet of transitional deposits which grade into the Mattaponi Formation; glauconitic sands and interbedded silts and clays of Upper Cretaceous to Eocene age (93-38 mybp). The transitional deposits of "beds" are recognized as a separate unit. The Mattaponi is of marine origin and is defined by the occurrence of glauconite, a green mineral closely related to the micas. At its greatest extent, it is no more than 100 feet thick.

The Mattaponi is overlain by 150 to 300 feet of clay and silt of the Culvert Formation. The Culvert is of Miocene age (23 mybp) and as such, is uncomformably in contact with the Mattaponi. Above the Culvert lies the Yorktown Formation. The Yorktown averages 310 feet in thickness and approaches to within 40 feet of the surface in the Back Bay region. The Yorktown is marked by its abundant sand, gravel, and shell beds.

Finally, the uppermost unit, the Columbia Group, is characterized by light colored clays, silts, and sands of recent and Pleistocene Age (2.5 mybp to present). These deposits range between 20 and 50 feet thick and include recent dune, beach, and river sediments.

4. Topography and Soils

The flatness of the lands surrounding Back Bay is the central topographic characteristic of the watershed. Pungo Ridge, along which Princess Anne Road runs, has the highest land elevations on the west side of the Bay, reaching 15 to 20 feet above mean sea level (msl) at several points. On the eastern boundary of the Bay, the sand dunes of False Cape present a second line of higher elevation, reaching 50 feet msl or greater at a number of locations and 64 feet at the highest.

In between these parallel ridges on the Pungo side lie the better drained uplands, falling away from the highest elevations to an imaginary line that is generally about five feet msl. This lower elevation is the upper edge of the flood plain. This is where the principal marshes and swamps of the Bay's edges are found; however, throughout the flood plain at its higher elevations and where the soils are inclined to dry out more readily, crops are farmed. Because of the universal flatness and low elevation of the land, flooding from high wind tides is a frequent problem for the farmers, particularly below the three- or four-foot contour levels.

The Soil Conservation Service has mapped the soils within the city of Virginia Beach. The major associations which are found within the refuge and study area include Acredale-Tomotley-Nimmo, Back Bay-Nawney, and Newhan-Duckston-Corolla. The following descriptions of these associations are taken from the Soil Conservation Service:

Acredale-Tomotley-Nimmo Association - This association consists of nearly level soils in broad, flat areas of the study area. The Acredale soils are slowly permeable; Tomotley and Nimmo soils are moderately permeable. This association is used mostly for cultivated crops, but some areas are in woodland or are used for community development. Much of this association has been cleared and drained; the drained areas have good suitability for cultivated crops. The main limitation for community development is a seasonal high water table.

Backbay-Nawney Association - This association is primarily found in the marshes and swamps of the study area and refuge. It consists of nearly level, frequently flooded soils on the flood plains of Back Bay and its tributaries. Slopes range from 0 to 1 percent. The Backbay soils occur in broad, flat marshes, while the Nawney soils occur in wooded drainageways and on flood plains. This association has little suitability for most uses other than as wetland wildlife habitat and for woodland. Flooding is the main limitation.

Newhan-Duckston-Corolla Association - This association consists of nearly level to steep, very rapidly permeable soils on grass- and shrub-covered sand dunes, flats, and depressions along the ocean. The Newhan soils are on undulating to steep coastal dunes and are excessively drained; Duckston soils are on nearly level flats and in

shallow depressions between coastal dunes and are poorly drained and/or flooded in some areas after heavy rainfall and by overwash by salt water; and Corolla soils are on low, undulating coastal dunes and on flats and are somewhat poorly drained to moderately well drained. Most areas of this association are covered by salt-tolerant grasses and shrubs. The major limitations of this association for community development are a seasonal high water table, the very rigid permeability, slope, and the instability of sparsely vegetated areas.

5. Surface Water Resources and Quality

Greater Back Bay is divided by its natural configuration of islands into five sub-Bays: North Bay, Shipps Bay, Redhead Bay, Sand Bay, and Back Bay proper. Numerous channels, narrows, and guts link the sub-Bays together as does cross-wetland drainage. The whole of Back Bay has a surface area of about 39 square miles. The surrounding uplands and wetlands cover an additional 65 square miles accounting for approximately 104 square miles of watershed land and water resources. The 65 square miles of land which drain into the Bay control to a large degree the quality of water in the Bay. Major drainage creeks that feed into the Bay from the surrounding watershed include Hell Point Creek and Muddy Creek at the northwest corner of North Bay, Beggars Bridge Creek at Shipps Bay, Nanney's Creek between Redhead Bay and Back Bay proper, and Devil Creek, the smallest of the creeks near the center of Back Bay proper. Surrounding lands are also drained by numerous drainage ditches that feed into the creeks or directly into the Bay.

Most of the Bay is quite shallow with an average depth of less than five feet. The Bay includes fresh to sometimes brackish water. It has one major outlet to the south into Currituck Sound. Water level fluctuations are caused primarily by the wind. Summer winds generally blow from the southwest, while in the winter, winds are more northeasterly. Strong southerly winds of several days duration can force water from Currituck Sound into Back Bay. Wind setups of three to four feet have been estimated in the northern part of the Bay. Strong northerly or northeasterly winds, over several days, result in the dewatering of northern and eastern coves in the Bay.

Back Bay supported a more saline environment when it was previously influenced by lunar tides. However, in 1850, when Currituck Inlet was closed by natural processes, this lunar influence was greatly diminished. Without the regular influence of ocean water, fresh water influence has predominated to create a fresh-brackish system. Only occasional storm overwash has brought in masses of salt water.

The brackish Bay waters were also formerly influenced by a salt water pumping station located one-half mile north of the refuge boundary. The station was operated by the city of Virginia Beach for the purpose of pumping ocean waters into the Bay. Salinity near the pumping station formerly averaged 10 to 15 percent of sea water.

Throughout North Bay and Shipps Bay, average salinity varied between nine and ten percent of sea water, while in Redhead Bay and Back Bay it ranged from 5.5 to 6.5 percent of sea water. Salinities of seven to eight percent of sea water formerly occurred in waters in the channels connecting Shipps Bay with Redhead and Back Bays (Howard, et al. 1976).

Declining salinities have occurred since the shutdown of the salt water pump in 1987. Refuge salinity testing in the fall of 1988 indicated salinities of approximately 2% in Bay coves immediately north and west of the refuge impoundments. Salinities of 1% to 2% have been observed in managed refuge marshes.

Major storms such as the Ash Wednesday Storm of 1962 can cause salinities to rise as high as 75% that of sea water. Salinities this high may have lethal effects on fish and aquatic plants that live in Back Bay. This will become more important as salinities decrease over the recent past and more freshwater-tolerant plants become established in Back Bay.

The salt water theory has been considered a solution to the problems of turbidity in Back Bay. Several studies have seriously questioned this hypothesis. Mann (1984) stated:

> "Water clarity is determined by water color (clear, brown), suspended soil particles, and phytoplankton growth. Back Bay water quality has been an area of concern for many years. The lack of vegetation in the Bay is often attributed to the lack of water clarity. The decision to introduce salt water to the Bay in 1964 was predicated on anticipated improvements in water clarity which in turn would result in increased growth of vascular vegetation".
>
> "Considerable statistical analysis conducted on the salinity and turbidity data revealed no correlation between the two parameters. Even during August, 1983, when salinity in North Bay was the highest it has ever been, no correlation was found. The lack of correlation is not surprising since a large change in turbidity can be observed as daily wind and wave conditions in the Bay change. Additionally, when clarity was greatest form 1975 through 1978, the salt water pump was inoperative for a large portion of the time and average Bay salinity ranged from 1.3% SS to 7.4% SS".

Turbidity fluctuations go a long way in explaining the aquatic vegetation changes that have occurred in Back Bay. Until the introduction of Eurasian milfoil in 1965, increased turbidity levels (probably from increased runoff due to intensified agricultural practices) caused the native SAV's to gradually die off. The spread of the milfoil probably lowered the turbidity levels in certain areas, thus allowing the re-establishment of other SAV's that were noticed in the 1970's. At the present time, Virginia Beach

continues to expand and turbidity from urban runoff has increased to the point where, during the past several years, even the Eurasian milfoil beds have nearly disappeared.

The water quality in Back Bay has begun to deteriorate from a number of additional factors as well. Quality has been, at times, fair to poor at the mouths of the tributaries and within several of the watershed creeks that have been subject to urban and/or agricultural runoff. Pollutant laden urban runoff, which is channeled into Back Bay from the surrounding watershed, adversely affects the water quality of North Bay and its tributaries. Future impacts of an urbanizing watershed could be severe. Agricultural impacts include excessively high concentrations of nitrogen and phosphorous in Back Bay and its tributaries from fertilizer applications, releases of liquid waste from hog waste holding lagoons, pesticides, and sediments from erodible fields which enter the Bay and creeks from the extensive drainage ditching system.

Water quality in the Bay may also be impacted by the large number of septic systems that are located in the study area. Some of these systems are built in poorly drained soils and may either fail to function properly or fail completely. Golf courses may also contribute to water quality problems.

6. Groundwater Resources and Quality

Mann (1984) identifies two primary freshwater aquifers in the Back Bay watershed that consist of the confined aquifer within the Yorktown formation and the shallower, unconfined aquifer within the overlying Columbia deposits. All municipal wells are generally within the confined aquifer, while many domestic wells are within the unconfined aquifer.

All major groundwater quality criteria, with minor exceptions, have been found to be within applicable concentration standards. Salt water intrusion has been found in deeper groundwater supplies. A small increase in overall nitrate concentrations in groundwater is evident and suggests the impact of agricultural activities. However, for the most part, nitrate concentrations in the shallow regional aquifer are low in comparison with other agricultural areas. In general, groundwater quality in the Back Bay watershed is good.

B. Biological Resources

1. Vegetation and Habitat

The diversity and distribution of flora along this barrier island system and its associated Bay marshes are both interesting and complex. Several factors have influenced the present vegetative makeup of the area. Man has had a significant impact on the original vegetation.

Historic records show that the barrier beach system was severely overgrazed in the 19th century resulting in the mobilization of large sand sheets and moving dunes. The cutting and burning of forested areas probably preceded the overgrazing. Forested areas have been culled many times in the past, undoubtedly changing the vegetative composition of the area.

Natural processes have also served to further shape the vegetative distribution and diversity on the barrier. Site-specific factors such as depth to water table, amount of salt spray, substrate stability, water salinity, and the effects of periodic flooding have significantly contributed to the vegetative pattern which now exists.

The vegetative communities of the refuge and study area are divided into the following groups:

Beach/Dune Grasslands - The majority of plants found along the beach are located between the wrack line and the toe of the dune. The wrack line is a zone of woody debris at the high tide swash line and provides a substrate for vegetation establishment. Pioneer species found in this zone are sea rocket (Cakile edentula) and American beach grass (Ammophila breviligulata). The relatively high, continuous dune line that is characteristic of the northern Outer Banks is colonized by a number of grasses, primarily American beach grass and sea oats (Uniola paniculata). The natural ranges of these two grasses overlap along this portion of the coast. Sea oats, which grow in less dense stands, reach their northern limits on the Virginia barrier islands, while American beach grass reaches its southern limits on the Outer Banks of North Carolina. The southern limit of beach grass has been artificially extended by plantings that are part of dune building and stabilization research.

Both grasses develop extensive horizontal rhizomes with rootlets that capture moisture from rainfall. These rhizomes further serve to bind sand and stabilize sand surfaces. Beach grass and sea oats are adapted to tolerate stresses such as salt spray, overwash, sand blast, and drought, all of which are characteristic of the foredune area. However, both species are extremely vulnerable to mechanical disturbance of the soils.

In stabilized areas of the dunes, conditions are more favorable, and the following species are noted: sea rocket, evening primrose (Oenothera humifusa), seaside goldenrod (Solidago sempervirens), beach pea (Strophostyles helvola), sandspurs (Cenchrus tribuloides), daisy fleabane (Erigeron canadensis), and spurge (Euphorbia polygonifolia).

Stabilized and protected interdunal depressions develop a high diversity of plant species. At False Cape State Park and the refuge, 129 species of plants have been identified. Distribution, abundance, and succession of these species are controlled by several

abiotic and biotic factors including soil moisture, interspecific competition, salt spray, migratory waterfowl activity, and feral hog and trespass horse disturbance (Tyndall 1977).

Dominant species in these depressions include salt meadow cordgrass (Spartina patens), needlerushes (Juncus spp.), three-square bulrush (Scirpus americanus), and broom sedge (Andropogon virginicus). Common herbaceous species include Centella asiatica, water pennywort (Hydrocotyle umbellata), aster (Aster tenuifoilius), and marsh purslane (Ludwigia palustris).

Woody vegetation on the perimeter of these depressions includes groundsel-tree (Baccharis halimifolia), wax myrtle (Myrica cerifera), bayberry (Myrica pensylvanica), black cherry (Prunus serotina), and live oak (Quercus virginiana). Availability of fresh water, diversity of seed producing and food plants, as well as vegetative cover provide habitat for many species of wildlife.

Barrier Spit Woodlands and Shrublands - A shrub thicket occurs throughout the length of the refuge and on portions of the study area where sites are naturally or artificially protected from oceanic influence. The buffering action provided by the fore and mid dunes is essential for the establishment of this arborescent zone. Where salt spray effects are the greatest, these species form low, spreading cover with areas of maritime grassland in between. Away from the ocean in shrub dominated areas, the growth pattern is taller and denser, forming a closed canopy.

The dominant shrubs of the shrub thicket community are: blueberry (Vaccinium sp.), American holly (Ilex opaca), yaupon (Ilex vomitoria), hudsonia (Hudsonia tomentosa), wax myrtle, red cedar (Juniperus virginiana), live oak, and groundsel-tree. Woody vines are also found in this community including greenbrier (Smilax bona-nox), Virginia creeper (Parthenocisus quinquefolia), grape (Vitis spp.), and poison ivy (Rhus radicans). The understory of the shrub thicket community is sparse and consists mostly of seedlings of the above mentioned shrubs and vines.

Cleared edges, roadways, and rights-of-way have been invaded by shrub thicket stands. This has created large areas of "edge space", and ecotonal habitat that many species of wildlife inhabit.

Shrub thickets merge gradually into forestland. The refuge has only a small portion of forest in the Green Hills area, adjacent to Barbour's Hill. The forest on False Cape State Park is located along the back dunes of the barrier system in areas not directly affected by ocean storms.

Forests located close to the ocean are low, generally reaching heights of less than 20 feet, and they exhibit dense lateral branching. This lack of apical dominance is caused by wind and salt

spray. Dominant species include live oak, red cedar, and laurel oak (Quercus laurifolia). Understory shrub species include American holly, black cherry, poison ivy, Virginia creeper, and grape.

Marshes - Slightly brackish marshes cover essentially all of the low-lying Bay shoreline areas of the barrier beach, most of the islands within the Bay, and the lower areas in the northerly and westerly portions of the study area.

The impoundments and marsh flats on the spit are dominated by plants such as cattail (Typha spp.), black needlerush (Juncus roemerianus), water hyssop (Bacopa spp.), spike rushes (Eleocharis spp.), salt meadow cordgrass, beggar tick (Bidens spp.), and three-square. A fragment of forest exists on the higher sand mounds in the marsh flats and impoundments. Dominant plant species include wax myrtle, live oak, red maple (Acer rubrum), loblolly pine (Pinus taeda), and greenbrier.

Most of the marshes of Back Bay are dominated by black needlerush. Common associates include cattails, arrowhead (Sagittaria spp.), seashore mallow (Kosteletzkya virginica), smartweeds (Polygonum spp.), marsh fern (Dryopteris thelypteris), and various grasses and sedges.

Considerable variation occurs in the composition and diversity of these marsh communities, depending upon such factors as successional stage, degree of disturbance, salinity, water table level, and local drainage pattern. In many places, marshes are composed of nearly pure stands of black needlerush. In areas that receive freshwater runoff, cattails are dominant. Big cordgrass (Spartina cynosuroides) often covers the outer fringes of marshes adjacent to open water.

Younger successional stages and more open areas are often dominated by three-square bulrush, saltmarsh bulrush (Scirpus robustus), soft-stem bulrush (S. validus), smartweeds and panic grasses (Panicum spp.). These areas provide excellent waterfowl food, but are apparently replaced in later successional stages by cattails or black needlerush. Areas which have been disturbed often come back in wild millet (Echinochloa crusgalli), reed grass (Phragmites communis), panic grasses, and three-square. Species of rooted aquatic plants in Back Bay include Eurasian water milfoil (Myriophyllum spicatum), sago pondweed (Potamogeteon pectinatus), and najas (Najas guadalupensis).

Forested Swamps - Brackish marshes of the study area gradually grade into forested swamp habitats. Swamps occur primarily adjacent to riverine systems including Nanney's Creek, Beggars Bridge Creek, Muddy Creek, and Hell Point Creek. Dominant overstory species include red maple, bald cypress (Taxodium distichum), sweet gum (Liquidambar styraciflua), black gum (Nyssa sylvatica), and black

willow (Salix nigra). Understory species typically consist of false nettle (Boehmeria cylindrica), royal fern (Osmunda regalis), greenbrier, poison ivy, and immature canopy species.

Lowland Forests and Agricultural Fields - Brackish marshes and forested swamp habitats of the study area gradually grade into low-lying, poorly drained agricultural fields and forests. These habitats are primarily below five feet msl. Primary agricultural crops consist of soybeans, corn, and wheat. Secondary crops include a variety of vegetables. Lowland forests of the study area primarily occur as small isolated stands, many of which are surrounded by agricultural lands. These forest stands are typically unsuitable for agriculture. Overstory species typically consist of loblolly pine, sweet gum, laurel oak, white oak (Quercus alba), tulip tree (Liriodendron tulipfera), southern magnolia (Magnolia grandiflora), black cherry, and hickory (Carya spp.). Understory species include flowering dogwood (Cornus florida), wax myrtle, green brier, Virginia creeper, highbush blueberry (Vaccinium corymbosum), poison ivy, and immature canopy species.

2. Wildlife

Although the Back Bay area is noted for its formerly large wintering waterfowl populations and its once significant sport fishery, it does exhibit a diversity of other wildlife. Following is a general discussion of the wildlife of the refuge and study area:

a. Waterfowl

Back Bay and the associated marshes and swamps provide important resting and migration habitat for a diverse waterfowl population. Species include Canada geese (Branta canadensis), greater snow geese (Chen caerulescens), tundra swans (Cygnus columbianus), and 17 species of ducks. Waterfowl generally begin arriving on Back Bay in late August through September. Diversity peaks in October with over a dozen species typically being present at any one time. Peak populations generally occur in November and December and waterfowl disperse in February and March.

Notable dabbling duck species include Northern pintail (Anas acuta), mallards (A. platyrhynchos), black ducks (A. rubripes), gadwall (A. strepera), and wood ducks (Aix sponsa). Mallards, black ducks, wood ducks, and gadwall also breed on the refuge and study area in limited numbers. Diving duck species observed using the Bay have decreased drastically in both diversity and abundance. The vast rafts of canvasbacks (Aythya valisineria) recorded in the Bay as late as the mid-1970's no longer occur. However, small numbers of bufflehead (Bucephala albeola), common goldeneye (B. clangula), ruddy ducks (Oxyura jamaicensis), lesser scaup (Aythya affinis), redheads

(A. americana), ring-necked ducks (A. collaris), common merganser (Mergus merganser), and hooded merganser (Lophodytes cucullatus) still winter on the Bay.

Table 1 lists peak waterfowl populations on the refuge between 1983 and 1987. Population data for the study area is not available.

Table 1. Peak Waterfowl Populations for Back Bay NWR 1983-1987

Wintering Species	1983	1984	1985	1986	1987
Geese (Snow and Canada)	5,318	8,125	6,600	8,600	12,750
Ducks	5,677	8,269	2,583	2,249	4,262
Tundra Swans	825	4,000	500	512	500

b. Additional Migratory Species

Since establishment in 1938, some 259 bird species have been observed on the refuge and study area. Most of the species are migratory and, therefore, may be present only a portion of the year. Besides the waterfowl mentioned previously, these birds include a variety of shorebirds, marsh and wading birds, water birds, raptors, and passerine birds. Notable species include great egret (Casmerodius albus), snowy egret (Egretta thula), great blue heron (Ardea herodias), marsh hawk (Circus cyaneus), osprey (Pandion haliaetus), peregrine falcon (Falco peregrinus), red-tailed hawk (Buteo jamaicensis), and great horned owl (Bubo virginianus).

c. Mammals

Besides wintering a diversity of waterfowl, the marshes, swamps, and upland fringe habitats of the refuge and study area provide habitat for many mammals including white-tailed deer (Odocoileus virginianus), raccoon (Procyon lotor), gray fox (Urocyon cinereoargenteus), otter (Lutra canadensis), mink (Mustela vison), muskrat (Ondatra zibethicus), nutria (Myocastor coypus), and marsh rabbit (Sylvilagus palustris).

d. Fishery Resources

At one time, the freshwater fishery in Back Bay and Currituck Sound was called "one of the best in the country", particularly for largemouth bass. Today, however, bass fishing has been severely limited due to the decline of SAV's in the Bay.

Other important species of sport fish in the Bay are striped bass, black crappie, chain pickerel, flounder, bluegill, pumpkinseed, and bluespotted sunfish. In the more northern Bays, Atlantic needlefish, silversides, white perch, and

pumpkinseed are important sport catches. On the ocean side, surf fishermen catch croakers, spot, striped bass, weakfish, kingfish, bluefish, and flounder.

Commercial fish catches in Back Bay include white perch, catfish, carp, shad, herring, and eels. White perch are taken in gill nets in deep open parts of the Bay. Other species are caught in haul seines and set nets. Croakers, spot, weakfish, and bluefish are taken commercially by haul seine and gill nets from the ocean surf. The best commercial catches are made in the spring and fall. Croakers are caught from mid-April through August, and spot are caught from mid-April through November. Striped bass and bluefish are taken from October through February, while shad are caught from February through April.

e. Invertebrates

The primary food of fishes in Back Bay are various benthic invertebrates, including numerous kinds of insect larvae and small crustaceans. The most commonly collected invertebrates include the midges (Chironomidae) and scuds (Amphipoda). Other common macrobenthic invertebrates in Back Bay include at least six orders of insects which have aquatic larvae, earthworms (Oligochaeta), snails (Gastropoda), crustaceans (Isopoda and Decapoda), and clams (Pelecypoda).

Back Bay offers a wide variety of habitats to aquatic macrobentos and fish. The shore zone, with thick deposits of organic detritus, occasional sand flats, patches of emergent, submerged and floating vegetation, and even areas of the open water, provides excellent habitat for a variety of organisms. Within each habitat, different organisms occupy specific levels in the food chain. Some, including the mayflies (Ephemeroptera), function primarily as herbivores and feed on the microscopic plants present. Others, such as the damselflies and dragonflies (Odonata), are predators of other aquatic insects. Still other organisms like the scuds (Amiphipoda) are scavengers and utilize the decaying material of the bottom as an energy source. In turn, many of these organisms serve as important food items for fish as well as waterfowl and other waterbirds.

C. Socioeconomic Resources

1. Land Use

The study area is a relatively rural area with developable uses of the land primarily in agriculture, with the exception of the Sandbridge community. The area has retained this basically rural, agricultural character for more than 300 years.

The majority of the study area exists in a natural state with approximately 60% of the land consisting of brackish marsh and forested swamp. Lowland forests exist on soils that are insufficient to support farming. Remaining lands exist as agricultural fields. Farm houses and associated buildings, residential development, and limited commercial areas are scattered throughout the study area.

The study area falls within several zoning categories. Zoning south of Sandbridge Road is primarily agriculture and preservation. A strip north of Sandbridge Road is zoned business, while the remainder is zoned for residential uses of varying intensities. In the community of Sandbridge, the zoning is residential. Sandbridge has been developed for high density resort homes over the past two decades. It is the only densely settled portion of the study area. Much of Sandbridge is separated from Back Bay by a series of finger canals and marsh.

Despite the overall rural, undeveloped character of the study area, the fact that it lies in one of the fastest growing metropolitan areas in the nation is a challenge to its rural character and current land use pattern. Development in much of the study area has been curtailed by establishment of the Green Line and short-term overlay zoning laws; however, once city services catch up with development north of this line, a comprehensive city plan is developed, and land becomes scarce, the potential for large-scale housing development in the study area will become economically attractive and financially feasible. Demand for housing in the city continues to increase and the trend of the study area is towards increased development. In fact, under Ag-2 zoning (one-acre lots), small subdivisions have begun to be established in this area.

2. Economy

The Virginia Beach Planning Department (1982) reports that white collar workers are the largest component of adult heads of household in the city (36%), followed by blue collar (22%), military (18%), other workers (5%), and retired or not employed (19%). The Virginia Employment Commission reports a July, 1988, unemployment rate of 3.4%. Studies conducted by the Bureau of Economic Analysis show a 1984 per-capita income of $13,793 for Virginia Beach and a statewide average of $13,291. Workers in the area are employed by the military, in retail and wholesale trades and services, in manufacturing, on the docks, in agriculture, and in higher education. The tourism and recreation-related industries make a significant contribution to the economy of Virginia Beach. During 1986, 2 1/2 million visitors generated over $431 million in revenue.

The economy of the study area is primarily based on agriculture, with the exception of Sandbridge. Agriculture is one of the major segments of the city's economic base and has been by virtue of its long history and tradition in Virginia Beach. Agricultural acti-

vities are concentrated on the rasing of hogs and the growing of grains, principally winter wheat, field corn, and soy beans. More recently, several local farmers have converted to farming organically grown fruits and vegetables for private and commercial use.

Sandbridge is a residential/recreational community of about 800 homes. During the summer months, over one-half of the dwelling units are occupied by non-resident property owners or short-term tenants. Income is derived in Sandbridge from rental of recreational properties or from sale of goods and services. Businesses in Sandbridge include a market, a convenience store, two restaurants, a gift shop, a gasoline station, a bait and tackle shop, and realty companies.

3. Social

The city of Virginia Beach is one of the fastest growing coastal cities of the United States. Because of the high quality and diversity of its environmental resources, the city has long attracted residents and businesses. Its proximity to the naval and maritime facilities of Portsmouth, Norfolk, and Newport News, and specifically as the location of the Oceana Naval Air Station, Camp Pendleton State Military Reservation, Little Creek Naval Amphibious Base, Fort Story Army Post, and other military installations have made it an attractive location for military and civilian personnel and their families.

The city has undergone a period of phenomenal growth since incorporation in 1962. From 1960 to 1980, the population for all of Virginia Beach nearly tripled from 85,218 to 262,199. Current estimates now total 390,000 which is projected to reach 585,000 by the year 2010, an increase of 50%. Despite the phenomenal growth of the population of the city from 1960 to 1980, the population of the study area has experienced only modest growth during the same time period. With the exception of Sandbridge, the study area supports a primarily rural population. However, the semi-rural atmosphere of the study area is attracting residents. In addition, once growth becomes saturated in the northern portion of the city, the study area will absorb a greater percentage of the city's overall growth.

The city's population is relatively young with school-aged children (ages 5-19 years) comprising 23% of the population; 63% is represented by the 20-64 age group, and that segment of the population over 65 comprises 6%. Educational levels are high in Virginia Beach with 87% of all adults being high school graduates and 53% with some college education.

4. Historical and Archaeological Resources

The Spanish were probably the first Europeans to sail the waters off the Outer Banks of Virginia and North Carolina. They were in the area in the early sixteenth century, but evidence of their landings, if any, is lost.

The earliest English colonization attempts in America occurred in the Tidewater area. From 1584 through the early 1600's, a number of early settlements were begun, some to no avail, such as the "Lost Colony" of Roanoke Island. By 1607 the first permanent colony was established at Jamestown after having first landed at Cape Henry in what is now Virginia Beach. Subsequent to this, colonization centered on the mainland portions of Virginia and North Carolina. The Outer Banks remained isolated from the mainstream of activity in early America, and those few people who lived there relied heavily on activities associated with the area's natural values for their subsistance.

Activity in the northern Outer Banks area reached a peak in the late 1800's when commercial fishing and market hunting were at an all-time high. A number of hunting clubs were established for sport hunting of waterfowl and drew much of their membership from affluent northern businessmen and professionals.

The hazard to shipping caused by the shoals near the Outer Banks resulted in numerous wrecks along the coast. Lifesaving stations were established at intervals along the coast, including the station at Little Island and the Wash Woods Station at False Cape. The refuge does not have any historical or architectural sites listed on the National Register of Historic Places or the Virginia Landmarks Register.

While few systematic archaeological surveys have been performed in the vicinity of Back Bay National Wildlife Refuge, a number of prehistoric archaeological sites exist within the present refuge bounds, and the probability of further sites within the proposed acquisition area is very high, particularly on terrace edges bordering the wetlands.

Documented historic settlement of the Ashville Bridge Creek and Nanney's Creek area dates from the second half of the 17th century onward, with several plantations occupying the mainland uplands along the edge of the proposed acquisition area. In the early 18th century, at least some of these had landings at the present wetland edge, and subsidiary plantations on islands within the present Back Bay Refuge. The probability for presence of standing buildings from these plantations or archaeological remains of vanished plantations is high within the study area.

5. Recreation

Because of its scenic ocean beaches, marshes and Bays, and accessible recreational opportunities, the city of Virginia Beach has become a major summer tourist haven. The beaches are the primary attraction for these tourists; however, the Back Bay area provides excellent opportunities for wildlife-oriented recreational activities.

Historically, the Back Bay region is well known for its waterfowl hunting and its fishery resources. According to the Virginia Outdoors Plan (1984), fishing is among the twelve most popular activities within the Hampton Roads region, and there is an ample resource to support many times the anticipated resident demand. However, in some cases, public access is limited. Additional boat launch ramps are needed in most of the localities. Largemouth bass, bluegills, and black crappie are the most popular fish species in the Bay. Surf fishing is also a popular activity on the ocean side.

Hunting programs currently exist on the refuge, False Cape State Park, and the Pocahontas and Trojan Wildlife Management Areas. The State Department of Game and Inland Fisheries provides public hunting programs for waterfowl, as well as limited deer hunting. The refuge conducts an annual deer hunt and has a trapping program. Additional opportunities for public waterfowl hunting exist on several hunt clubs in the study area. The refuge and study area provide excellent opportunities for birding during the spring and fall migrations and throughout the winter. Additional activities include photography, wildlife observation, and hiking. Crabbing is also a popular activity.

6. Aesthetics

The expanse of natural resources that characterize the refuge and study area are of immeasurable value. The diversity of habitats such as the beaches, dunes, extensive marshes and islands, bays and streams, swamps, woodlands, and farmlands all contribute to the scenic quality of Back Bay. Probably the most striking quality of the area is the long, unbroken beach/dune vista and extensive marshes. This visual resource is important because of the increasing scarcity of unspoiled coastal barrier islands. The area also provides a vivid contrast to developed areas located just north of the area.

From the dune ridges, vistas span from ocean to the marsh, giving the area a sense of ecosystem continuity. The undeveloped nature of Back Bay and its mainland shoreline provide a viewing experience rare along the southeastern Virginia shore. The extensive marshes give way to forested swamp, woodlands, and farmland to the north and west.

Although much of the landscape within the refuge and study area has been altered by man, some of these modifications, such as dune building and impoundment construction, have effectively blended with the environment. Currently, alterations in the study area are primarily agricultural in nature, thus preserving the rural character of the area. A few large developed areas are also evident.

The roads atop the diked impoundments provide the visitor the opportunity to view the wildlife from close at hand. These refuge trails provide a unique opportunity for the visitor to experience the unspoiled beauty this area provides. Public access to Bay resources within the study area is currently limited to only a few sites along major public roads and from publicly owned lands.

IV. ENVIRONMENTAL CONSEQUENCES

A. Alternative 1 - "No Action"

Under a No Action alternative, the Service would primarily rely on the strength of existing local, state, and federal laws and regulations and the conservation ethics of the affected landowners to protect important wildlife habitats identified in this Environmental Assessment. It is now well recognized that in addition to wildlife and fisheries values, wetlands serve a variety of other important functions. Wetlands provide the following hydrologic functions: flood storage, groundwater discharge and recharge, water quality protection, and shoreline stabilization. As some of the last vestiges of open space, wetlands have high recreational, aesthetic, and educational values. Despite this heightened awareness, significant acreages will be lost or severely degraded because existing laws are inadequate in the face of intense development pressure and are not adequately enforced on many levels. The economic trend of Virginia Beach is continual expansion resulting in increased commercial and residential development. Conservation-oriented landowners are often unable to maintain their property as open space due to financial constraints and may have no other alternative but development of their property.

As undeveloped land becomes scarce in the future, pressures for recreational, residential, commercial, and industrial development will intensify on environmentally sensitive areas. The Section 404 permitting process, the primary federal vehicle for protecting wetlands, allows the destruction of certain wetlands, if specific wetland parameters are not met. The Army Corps of Engineers, which administers the 404 program, requires positive indicators of three parameters in determining what constitutes a wetland: hydrology (permanent or periodic inundation by groundwater or surface water); soil (inundated or saturated soil conditions); and vegetation (those plants typically adapted for wet soil conditions). Thus, some functionally valuable wetlands, particularly forested swamps, are essentially unregulated if they do not fully meet the specifications of all three criteria. The 404 program does not address the drainage of wetlands for agricultural purposes. A typical scenario is clearing of forested wetlands to create marginal farmlands and eventual filling of these lands for conversion to residential and/or commercial development. Furthermore, the Corps considers fish and wildlife impacts along with many other factors in determining whether a proposed project is in the public interest.

On a state level, non-tidal forested wetlands are unregulated, as Virginia does not have a non-tidal wetlands law. In the Virginia General Assembly, the House of Delegates passed a non-tidal wetlands bill in late 1988; however, Senate action was deferred until 1989. The bill is highly controversial. From the mid-1950's to the late 1970's/early 1980's, nearly 60,000 acres of forested wetlands were lost in the Commonwealth of Virginia. This loss represents seven percent of the state's forested wetlands.

Tidal wetlands come under the protection of the State Wetlands Act of 1972. A major loophole in this Act allows the development of wetlands of "lesser ecological significance" in the Tidewater Virginia area. The Act does not address tidal forested wetlands unless specific wetland vegetation is present in the understory. Losses of coastal wetlands also occur under this Act, as well as under the federal 404 program. Many of these losses are small scale and while they may not appear important individually, the cumulative effect can be substantial. From the mid-1950's to the late 1970's, over 5,000 acres of tidal marsh were lost in Virginia, primarily to urban development.

On a local level, additional land protection is provided by various zoning and land use regulations; however, these are generally insufficient in the face of heavy development pressures and are also not static. For example, the Green Line is not a permanent feature, but is subject to change. It was established as a mechanism to allow city services to "catch up", not necessarily as an environmental protection mechanism. Green Line zoning has also been challenged successfully in the local district court on specific parcels. In addition, existing zoning regulations allow preservation lands to be developed as golf courses, campgrounds, outdoor recreation, and amusement facilities.

More importantly, existing laws and regulations often do not adequately address the destruction of upland edge habitats. Within the study area, this "edge", where upland and wetland communities meet, provides food, cover, breeding habitat, and travel corridors for resident and migratory wildlife. It also serves as a natural filter, maintaining water quality and the general integrity of the wetland system. Development of this habitat degrades the quality of the marsh through increased storm water runoff, sedimentation, and leaching of septic effluents into ground and surface water; thus diminishing the value of the marsh for those fish and wildlife species dependent on it. An example of this development of edge habitat can be found at Three Pines Lane, adjacent to Nanney's Creek, where a small subdivision has been constructed along the edge of the marsh. Existing zoning allows the development of one- to three-acre lots on farmland within 600 feet of a road. This has resulted in several small subdivisions and single homes within the study area.

Following is a brief discussion on the impacts of a No Action stance by the Service on selected environmental factors:

1. Physical Resources

   a. Air and Noise Quality

   Planned and unplanned growth and development of an area will result in increased traffic, housing and population growth, with subsequent decreases in air quality and increased noise levels. Minor adverse changes in ambient air quality due to residential and commercial development would result primarily as a consequence of increased vehicular (and possibly boat) traffic and home heating fuel emissions. Some pollutant

emissions would also result from construction equipment during excavation operations. The principal pollutants from the vehicle sources would be carbon monoxide, nitrogen dioxide, and hydrocarbons.

Ambient noise levels due to development activities will be greatest during clearing, excavating, and grading operations as well as building construction itself. The average background noise level from cars, lawn mowers, chain saws, and other home care equipment could be expected to range from between 52 dBA up to 85 dBA. Proper planning so as to leave forested buffer strips can significantly and effectively reduce noise levels. Noise tolerance is very subjective and will vary considerably from one person to another.

b. Soils

Soils composition and properties would be altered somewhat from present conditions. Site preparation and construction, as well as filling and dredging activities, would alter the character of the surface soils at the project sites. Grading and filling operations would increase the compaction of subsurface soils, decrease soil fertility, and would change its permeability and drainage characteristics. Extensive excavation and levelling required for a subdivision layout or filling and dredging for a marina would result in the removal or covering of extensive areas of topsoil. Paving and building construction would also change the permeability and runoff characteristics of the soils. Pollutants from vehicle emissions, oils, and coolants accumulate in roadside and parking area soil, which will affect the overall fertility of the soils. Removal of trees and other ground vegetation can also cause severe erosion problems and transport of sediments into waterways.

c. Hydrology and Water Quality

Under this alternative, it is expected that the decline in the quality of the Back Bay resource would continue and even accelerate. The turbidity and sedimentation in the Bay may worsen as a result of increased destruction of upland habitats from associated residential and commercial developments. The loss of wetlands through drainage and filling will increase turbidity via the loss of the critical filtering effects. Critical edge habitat losses will accelerate this process as sediment and pollutant laden urban runoff will directly enter the wetland system. Leakage of septic system effluent may further impact water quality. Restoration of former wetlands will not occur as low-lying sites are permanently converted to developed areas. Flooding damage from future storm events will likely increase.

2. Biological Resources

a. Vegetation and Habitat

Development would result in the direct loss and degradation of vegetation in and around the disturbed area. Upland habitats adjacent to the marsh are typically the most susceptible to development pressures, particularly when scenic marsh or ocean views are involved.

This loss of critical edge will indirectly impact wetland habitats through increased pollutant ladened runoff and septic effluent leakage from adjacent urban developments. Sedimentation will contribute to a change in plant communities by increasing turbidity, thus eliminating less tolerant submergent aquatic vegetation. Areas of needlerush and phragmites will likely increase due to disturbance and lack of control efforts.

b. Wildlife

The direct loss and degradation of habitat will adversely impact both resident and migratory wildlife species. The loss of edge habitats are of particular concern, as this area supports the largest diversity of wildlife species.

Development of edge habitats also degrades the quality of adjacent wetlands for the fish and wildlife resources dependent upon them through sediment and pollutant ladened runoff and leaching of septic system effluent. This loss in water quality will impact important prey species.

The objectives of the North American Waterfowl Management Plan would not be furthered by this alternative. The preservation of marshes and wetlands in the Atlantic Coast, particularly for wintering black ducks, is an important objective of this joint international, public, and private effort. Management efforts which would be employed by the Service to meet Plan objectives would not occur under this alternative. A diversity of waterfowl species which rely on the Back Bay marshes for migration and wintering habitat would be impacted.

3. Socioeconomic Resources

a. Land Use

As the prosperity of Virginia Beach continues, the trend to residential and commercial uses will continue with the conversion of agricultural lands, forests, and marginally developable "wetlands". Intense development pressure on the study area can be anticipated in the future. The cost and difficulty of providing sanitary waste treatment and drinking

water to large-scale residential development in the southern portion of the city have kept the cost of multi-unit construction high, relative to costs in other areas of the city. However, as land becomes scarce, large-scale development in the Back Bay area will become economically feasible.

b. Economy

Residential and commercial development will result in increased employment in construction and related industries. Development will also broaden the city's tax base. Concurrent with this development, however, is an increased demand for services including police and fire protection, education, road maintenance, sewers, water, and utilities.

The fishing and tourism industries, which the city relies on heavily, may suffer indirectly from this development. Open space lands provide a variety of recreational opportunities that attract vacationers to the area.

c. Social

The current quality of life exhibited in southeastern Virginia Beach will be impacted as a semi-rural atmosphere succumbs to commercial and residential development. This development will result in accelerated population growth that will stress the resources of the city. A reduction in water quality, open space, and recreational opportunities will further impact the quality of life for the residents of the city. The overall feeling of the city and residents is to maintain the semi-rural nature of the southern portions of Virginia Beach. Some individuals may prefer the additional economic vitality of the city that results from increased job opportunities for construction-related industries.

d. Historical and Archaeological Resources

Under private ownership, protection and preservation of the cultural resources in the study area would be the responsibility of the landowner. Because of prohibitive costs, it is unlikely that historic structures and cemeteries would receive the protection necessary to maintain their historic character. Archaeological data might be destroyed by development of the land for residential and commercial uses.

e. Recreation

Development of residential homesites and the resultant population growth will increase the demand for recreational opportunities. At the same time, less open space land will be available for recreational use. Thus, the remaining resources will be stressed, often to the detriment of those wildlife species dependent on them.

f. Aesthetics

The presence of homesites, resorts, marinas, and other developments negatively impacts the aesthetic qualities of natural areas and open space lands. The feeling of solitude and uncrowded surroundings, which these lands offer, will be lost.

B. Alternative 2 - "Proposed Action"

This section assesses the impacts of Service acquisition of approximately 6,340 acres of important wildlife habitat. This alternative will allow the Service to purchase land through fee title acquisition, accept land donations, negotiate less-than-fee agreements (conservation easements, management agreements, lease agreements) with landowners who do not wish to sell fee title interest, work with state, local, and private conservation agencies to protect and manage wildlife habitat, and provide administrative and public use sites for the expanded refuge.

Following is a brief discussion on the impacts of Service acquisition on selected environmental factors:

1. Physical Resources

a. Air and Noise Quality

The proposed land acquisition will help maintain the present condition of air quality by preserving forested swamp, marsh, low-lying farmland and woodlands.

b. Soils and Topography

Expansion of the refuge could result in minor localized disturbance to the soil and topography through the construction or improvement of the trails, parking areas, photo blinds, overlook platforms, and boat launches. Appropriate precautions will be taken during the planning and construction of any facilities to ensure minimal disturbance to soil and topography. Resource protection will limit residential and commercial development in the Back Bay watershed area. Refuge management of these areas could significantly reduce nutrient loading and runoff from residential areas. This will lessen future degradation of important Bay resources. The impact on soils due to development, which were outlined in the No Action alternative, would not occur on lands under Service ownership.

c. Hydrology and Water Quality

There has been much discussion concerning the actions needed to restore Back Bay as a productive resource. The actions outlined in this alternative are not intended as a panacea to the problems facing the Bay. This proposed action by the Fish and Wildlife Service is only one of the steps that will be

required if the Bay is to return to its former position as a highly productive surface water resource. The protection and management of marshes and fringe uplands around the Bay will ensure that these areas are available to perform the functions of filtering runoff and providing wildlife habitat. Protection of these lands will prevent excess erosion, sedimentation, and introduction of pesticides, metals, petroleum products, septic system effluents, and other pollutants that generally occur with development activities. Restoration of former wetlands and establishment of permanent cover (grasses) on areas adjacent to them, as well as the management of ditches through plugging and placement of water control structures will, in all likelihood, decrease the amount of siltation and nutrients in existing runoff. This will have positive benefits on the quality of the Bay system. Enactment of this alternative will not prevent the city of Virginia Beach from providing appropriately sized sewer lines to residents in the community of Sandbridge, should they so desire.

These actions alone will not "save" Back Bay. It will take a concerted effort by several levels of government and the private sector if the Bay is to recover. The city of Virginia Beach has already recognized this fact through the establishment of a Stormwater Management Ordinance that is designed to limit the effects of runoff on bodies of water within Virginia Beach. Private conservation organizations, as well as several local farmers, are attempting to address Bay problems through the placement of water control structures in ditches and by modifying farming techniques. The waters of the Bay itself are owned by the state of Virginia, which must share some responsibility in the effort to restore this valuable resource. The state has recognized this and regularly conducts studies and sampling to monitor the conditions in the Bay. The role of the Fish and Wildlife Service, then, is to cooperate in the multi-faceted effort to restore this resource. As development continues up to the edge of the wetlands ringing the Bay, recovery of the Bay resource will be that much more difficult, due to the additional impacts associated with this added development. By purchasing and managing the lands outlined in this alternative, the Service will become an active participant in the effort to preserve the resources of Back Bay.

This cooperative effort could discourage the use of the Bay as a sink for the agricultural and urban runoff which is collected in an extensive drainage system throughout the Back Bay watershed. Installation of water control structures to filter sediments and pollutants before they enter the Bay and modification of development and agricultural practices would significantly improve water quality of the Bay. In improving water quality, existing SAV's would increase which could lead to a positive feedback loop, as SAV's stabilize substrates and

increase water clarity allowing for further SAV increases. SAV's also improve water quality by taking up nutrients present in the water column (Water Control Board, 1989).

2. Biological Resources

a. Vegetation and Habitat

Under this alternative, the Service will acquire and manage habitat for wildlife values. As individual parcels are acquired for inclusion into the National Wildlife Refuge System, Refuge Managers carefully evaluate the management potential of these tracts. Protection, through the various forms of acquisition outlined earlier, is only one phase of the management effort. In accordance with Service policies and National Environmental Policy Act (NEPA) constraints, managers actively intervene to enhance and restore previously altered areas for the benefit of wildlife. The low, wet characteristic of the lands proposed for acquisition are ideal for restoration through management actions. Typical management techniques include: pest plant (phragmites) control through mechanical and chemical means, wetland restoration through ditch plugging, water control structure placement, moist soil management techniques, ground-nesting waterfowl habitat enhancement through modified farming techniques, wintering waterfowl management via the planting of winter wheat and other crops, and deer and woodcock management through the creation and maintenance of woodland openings. Farming management programs will be accomplished through leases and/or cooperative agreements with local farmers, as they are on many other units of the Refuge System. Acquisition of low-lying farmland will provide increased habitat diversity and management capabilities for a variety of wildlife. Silt retention traps may be installed on drainage ditches to filter sediments and pollutants. These techniques represent a small sample of the management options available to and employed by managers in general and Back Bay National Wildlife Refuge staff specifically. Other techniques could be utilized to enhance habitat for raptors, shorebirds, wading birds, and small mammals.

Current refuge management activities offer a view of the types of activities that would be employed on lands that are acquired. In short, management is geared toward enhancing emergent wetland habitats to partially offset the loss in quality of the Bay for waterfowl. Conditions which favor the production of three squares, spikerushes, cattail, bulrushes, water hyssop, and other emergents are encouraged. This is evident in the prime wetland habitats which exist at the back of the barrier spit portion of the existing refuge. These areas exist as a direct result of the activities of managers who have manipulated the area to create the conditions which favor these plants. Many of the lands that are proposed for

acquisition have been previously modified (drained, ditched, filled) so that these desirable wetland species are either absent or have been replaced by nearly solid stands of phragmites, black needlerush, and myrtle. Refuge managers have been successful in recent years at Back Bay and other East Coast refuges utilizing techniques which discourage these monotypic stands and favor higher value marsh species.

Habitat management is not performed on a whim. Management decisions are based on sound biological techniques and engineering data. For example, structures and plugs, which would be used to slow silt-laden runoff and restore previously drained areas, are designed by engineers who ensure that the management actions will not impact adjacent landowners. The environmental effects of proposed management actions will be analyzed in accordance with applicable provisions of NEPA. Activities will also be coordinated with the Virginia Natural Heritage Program to minimize impacts on state-designated natural areas.

In areas where wetlands have remained in their natural state, protection will probably be the most effective management scenario. Long-term protection can ensure that the influence of man does not further degradate important marshes and swamps. Examples of areas that would be strong candidates for management through protection, include the swamps and marshes in the vicinity of Black Gut and areas where threatened or endangered species are present.

b. Wildlife

This alternative would provide long-term protection of migration and wintering habitat for a diversity of birds. In addition, many other species of wildlife will benefit by this protection from further loss and degradation of habitat and from excessive human disturbance. Certain species, such as raptors, are especially sensitive to human disturbance requiring large undisturbed tracts of land. Fishery resources will also benefit through the protection of marsh nursery areas.

The numbers of migratory raptors, shorebirds, waterfowl, and songbirds that stop to rest and feed on Back Bay during the spring and fall migration, will benefit through the protection of upland edge and wetland habitats. Waterfowl, particularly black ducks, will benefit from the protection of nesting, brood rearing, migration, and wintering habitat. Federally endangered and threatened species, such as peregrine falcons and bald eagles, will benefit from protection of migration and wintering habitat. Potential bald eagle nesting sites, which could contribute to the success of the eagle reintroduction program, will also be preserved. Additional rookery sites for

wading birds will be protected. These areas are currently being lost in the northern section of the city due to ongoing development.

3. Socioeconomic Resources

a. Land Use

Under this alternative, there would be some minor changes from present land use patterns. For the most part, agricultural practices on acquired lands could continue through leases or cooperative agreements with former landowners or local farmers, with modifications to provide a food and cover source for migratory birds. Some marginal farmland (i.e., former wetlands) will be restored to their original state as marsh lands. Other marginal agricultural lands may be allowed to revert to later successional stages.

Acquisition of proposed lands would be consistent with the City Comprehensive Plan, in that it would preserve the semi-rural, agricultural atmosphere of the southern portion of Virginia Beach and would protect stream corridors and wetland edge habitats unsuitable for development. Service acquisition of agricultural lands would also be consistent with the City Farmland Preservation Program, in that it would protect farmland from future development.

b. Economy

On projects throughout the Northeast, land acquisition by the Service has generally not diminished local property values. In many instances, properties have become more valuable because of their location adjacent to a National Wildlife Refuge which ensures an undeveloped and aesthetic view in perpetuity. The value of land both within and adjacent to refuge boundaries is a reflection of local real estate market conditions. Any impact on real estate values from changes in zoning, homesite regulations, building codes, wetland regulations, etc., should not be attributed to boundary delineation.

When lands are offered to the Service from willing sellers, properties will be appraised at fair market value based on comparable sales. Appraisals are conducted by Service or contract appraisers, meeting both federal and professional standards. If only a portion of a property is acquired, compensation will be made to the landowner for any loss of value on the remaining portion.

The proposed action will remove some lands from the tax rolls; however, under provisions of the Refuge Revenue Sharing Act, the local unit of government receives an annual revenue sharing payment which often equals or exceeds the amount that would

have been collected from taxes, if in private ownership. In addition, the city will not have to provide costly public services to these areas. Payments in lieu of taxes are based on three-fourths of one percent of the fair market value of the property, which is reappraised at five-year intervals.

The revenue sharing fund consists of net income from the sale of products or privileges on refuge lands, such as timber sales, grazing fees, permit fees, and oil and gas royalties. Congress is authorized to appropriate funds to make up any shortfalls in the revenue sharing fund; however, if Congress fails to do so, payments are reduced accordingly. In 1989, the city of Virginia Beach received $191,834 from this fund which represents approximately 75% of the full funding level. This payment will increase as additional lands are acquired.

Maintenance of wetland quality will help assure the livelihoods of those dependent on the health of the natural resources, such as commercial fisherman and trappers. Tourism-related industries will also benefit through protection of the resources that attract visitors to the area for a variety of recreational purposes. Much of the recreational activity in the area occurs on publicly owned lands (city, state, and federal) located in the Back Bay watershed. Back Bay NWR currently receives approximately 100,000 visitors per year. Expansion of the refuge will allow additional opportunities for public use on formerly inaccessible private land, thus attracting additional tourists to the area for a greater contribution to the city's tourism industry.

c. Social

As lands are acquired, the Service will expand its comprehensive wildlife-oriented public use program that includes interpretive trails, wildlife exhibits, and educational workshops. The wildlife-oriented recreational and educational opportunities that the acquisition area provides will benefit local school groups, as well as local residents and visitors. The preservation of open space and enhancement of wetland areas will also benefit the quality of life for city residents.

d. Historical and Archaeological Resources

Under this alternative, the Service would be responsible under a variety of laws and regulations, including the Archaeological Resources Protection Act of 1979 (ARPA) and the National Historic Preservation Act of 1966, as amended, to protect any historic and archaeological resources within acquired areas. Any ground disturbance on the part of the Service will be closely coordinated with the State Preservation Officer to ensure that historic and archaeological resources are avoided

or mitigated. The Service has recently demonstrated its commitment in this area by funding an archaeological survey of the existing refuge.

Cemeteries located on the periphery of the boundary were excluded; however, small family plots located deep within the boundary were unavoidable. A variety of options are available for a landowner who wishes to sell their property that contains a cemetery. The landowner may wish to retain ownership of the cemetery, in which case the Service would establish a right-of-way for the landowner and his or her heirs, as they have a clear legal right to visit and maintain the graveyard and perform further burials where allowed by local authorities.

If the current landowner desires to transfer title to the Service, the Service will consider the interests of known descendants of those interred in the cemetery and other interested parties. Under Service ownership, descendants and interested parties will be allowed access to the graveyard for visitation and maintenance. Future burial would be considered on a case-by-case basis and could be accomplished through a Special Use Permit. The National Historic Preservation Act requires that the Service protect all Service-acquired cemeteries of potential historic and archeological significance from vandalism, theft, and neglect. The Act also mandates a high level of required maintenance and a high level of protection against federal agency actions. All cemeteries on Service property receive further protection from vandalism and theft from ARPA and the Antiquities Act of 1906.

e. Recreation

As the populations of the city of Virginia Beach and the rest of Hampton Roads increases, the demand for recreational use of open space lands will intensify. Currently, much of the demand is met by publicly owned lands. The Virginia Outdoor Recreation Plan (1984) identified a need for more open space and recreational lands as an important issue. Under this alternative, protection of lands will ensure the preservation of a number of wildlife-oriented recreational opportunities.

When determined to be compatible with refuge objectives, reasonable access onto refuge lands will be permitted and managed so that visitors can participate in activities such as fishing, shellfishing, wildlife observation, and photography. Privately owned boat launch sites within the proposed acquisition area may be maintained and/or improved for public use. The refuge currently maintains a launch site for roof-top boats near the headquarters. Hunting and trapping activities may be allowed, consistent with Service goals and objectives. The Service may allow deer hunting as needed to prevent overpopulation and resulting habitat degradation. As lands are

acquired, a public waterfowl hunting program may be considered on selected areas. Potential waterfowl hunting would be addressed in detail in a future Environmental Assessment and Refuge Hunt Plan. A trapping program is currently administered on the refuge to maintain a balance between furbearers, prey species, and their habitats. This program may be expanded on the acquisition area.

Although there is no dispute that recreational activities are a secondary consideration in the management of a National Wildlife Refuge, wildlife-oriented recreation is both welcomed and encouraged on most refuges, including Back Bay. Currently, nearly 100,000 visitors per year enjoy the facilities that are available on the existing refuge. Biking and hiking are the primary uses, with a significant amount of other activities occurring, including: nature observation and study, photography, fishing, hunting, and outdoor classroom visits by local school children. Since 1985, the refuge has spent over $10,000 developing and improving outdoor study areas for use by area schools. Similar emphasis is placed on maintaining trails for the public's enjoyment of the wildlife resource and the unique natural areas that the refuge has to offer.

Adequate public access is lacking on much of the area proposed for acquisition. There is a definite lack of boat launching and public fishing facilities on the northern and western sides of the Bay. The lack of public fishing sites is demonstrated by the number of individuals who continue to fish in Hell's Point Creek at Sandbridge Road--despite attempts by private land- owners to limit access through the placement of signs and earthen barricades.

In order to hunt in the privately owned woods and marshes surrounding the Bay, one must either be a landowner or belong to one of the local hunting clubs. Hiking, bird watching, and outdoor classroom opportunities are virtually non-existent in this area at present.

As lands are acquired, they will be examined for their recreational potential. Many of the activities outlined above are already allowed on the current refuge and would, in all likelihood, be permitted on newly acquired lands. However, providing the public with facilities for all the aforementioned activities may be beyond the scope of one agency. Refuge personnel would coordinate closely with the city and state to ensure that adequate and appropriate public-use facilities are provided. This cooperation could include: entering into cooperative agreements, cost-sharing of projects, joint management efforts, etc.

Public use will be managed so that visitor impacts will be minimized or avoided. Impacts may be minimized by controlling visitation on Service provided access areas, modifying regulations governing certain activities, and providing educational and interpretive programs to encourage and instill user behavior that is sensitive to the needs of wildlife. Some recreational opportunities may be seasonally restricted to prevent user conflicts or to avoid adverse impacts to nesting migratory birds and endangered species.

As sufficient lands are acquired, the refuge's Public Use Plan will be expanded to address activities in the acquisition area in detail. It is expected that general public recreational opportunities will increase significantly, since local landowners and gunning clubs do not often provide access for public recreation.

Activities on the Bay itself will not be affected by this proposal, as ownership of the Bay is reserved by the state. Access will continue from publicly and privately owned boat launch sites which are not within the proposed acquisition area.

f. Aesthetics

Acquisition of the study area will also preserve the aesthetic qualities that open space lands provide, particularly along the Back Bay shoreline. These aesthetic qualities are important to the resort economy of the area.

C. Alternative 3 - Minimum Acquisition Approach

The impacts of this alternative would be similar to the impacts of Alternative 2; however, only 26% of important wildlife habitat identified within the Proposed Action alternative will come under the protection of the Service.

D. Alternative 4 - Protection by Other Agencies

This alternative would rely on other federal agencies, state and local governments, along with private conservation organizations to acquire lands within the study area. Although various agencies have indicated a desire to protect habitat and limit development of the study area, it is unlikely that any would have the funds to undertake an acquisition project of this scope. Funding by these agencies is currently not sufficient to acquire, in a timely manner, the acreage necessary to preserve the Back Bay area as a functional ecosystem for migratory birds on a long-term basis. In addition, protection by other agencies may not address the needs and concerns of the city, nor would the city receive compensation in lieu of taxes.

Discussed below are the impacts of possible land protection approaches by agencies other than the Service:

1. Other Federal Agencies

Any lands entered into the Conservation Reserve Program of the USDA by qualified farmers would complement Service acquisition efforts. This program could serve as an alternative to farmers who are interested in preservation, but do not wish to sell fee title or development interests in their property to the Service. Enrollment in the CRP is limited, and the continuation of this program will depend on the provisions included in the 1990 reauthorization of the Farm Bill.

2. Commonwealth of Virginia

The primary agencies associated with state protection would be the Department of Conservation and Historic Resources through the Division of State Parks and the Division of Natural Areas Conservation (Natural Heritage Program), along with the Department of Game and Inland Fisheries. Discussions with several state officials in these agencies indicate that funds are not readily available for acquisition in this area. Operational funding for both the Parks and Game Departments may not be available for management. None of the agencies have presented a proposal for protection in this area. Furthermore, while state park protection would prevent some development and habitat degradation, parks are generally protection-oriented and do not have the expertise or the desire to actively manage for wildlife habitat improvement.

3. City of Virginia Beach

The city is concerned about development in the southern portion of Virginia Beach. Funding for acquisition, maintenance, and management would be a problem for the city due to other, more pressing, infrastructure needs (roads, schools, and services in a rapidly growing area). It is unlikely that the city would undertake a project of this type. Even if it did, management objectives would be more recreation-oriented and not necessarily consistent with the needs of waterfowl and other migratory birds.

4. Private Conservation Organizations

Acquisition of lands within the study area by private conservation organizations could provide adequate habitat protection. However, agencies such as The Conservation Fund, The Nature Conservancy, and the Trust for Public Lands generally act as interim owners until the federal land acquisition approval

process is complete and funds for acquisition and management budgeted. Lands can then be donated or resold to the Service for inclusion in the National Wildlife Refuge System.

Protection by Ducks Unlimited has been discussed by several residents in the local area. High land values and Ducks Unlimited commitments elsewhere appear to limit the potential for acquisition by them.

For the most part, the role these groups play in the protection process would be that of facilitator with the ultimate responsibility of ownership and management resting with the Service. It is unlikely that these agencies would undertake long-term protection and management on study area lands.

E. SUMMARY

The Service has chosen Alternative 2 as the "Proposed Action". Alternative 1, which relies on existing local, state, and federal laws and regulations would not provide adequate protection to important wildlife habitat identified in this Environmental Assessment. Alternative 3 would protect only a portion of these important habitats. Alternative 4, which relies on other federal, state, city, and private conservation agencies to acquire important wildlife habitat within the study area, is not a viable alternative because it is unlikely that any would have the funds to undertake an acquisition project of this scope.

V. COORDINATION/COOPERATION

During the planning stages of this proposal, the Service was in direct contact with a variety of governmental agencies, conservation organizations, landowners, and interested members of the public. Through this contact early in the planning process, the Service was able to identify the needs and concerns of the affected individuals and organizations.

Listed below are the agencies and organizations contacted during the preparation of this Environmental Assessment:

Federal

Virginia Congressional Delegation
- Honorable Charles Robb, U.S. Senate
- Honorable John Warner, U.S. Senate
- Honorable Owen Pickett, House of Representatives

State

Chesapeake Bay Local Assistance Department
Council on the Environment
Department of Game and Inland Fisheries
False Cape State Park
Natural Heritage Program

Multi-Agency

Atlantic Coast Joint Venture Policy Committee

City

Agriculture Director
Environmental Coordinator
Manager
Mayor
Planning Department
Virginia Beach City Council

Conservation Organizations

Back Bay Restoration Foundation
The Conservation Fund
National Audubon Society: Cape Henry Chapter, Virginia Beach Chapter
The Nature Conservancy, Virginia Chapter

Civic Organizations

Back Bay Citizen's Alliance
Back Bay/Pungo Civic League
Friends of Back Bay/Save Our Sandbridge
Lago Mar Civic League
Sandbridge Civic League

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